

THE THOMAS VICARY LECTURE
A
GLIMPSE INTO THE HISTORY
OF THE
SURGERY OF THE BRAIN

SIR CHARLES A. BALLANCE

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The Thomas Vicary Lecture

A

GLIMPSE INTO THE HISTORY OF THE SURGERY OF THE BRAIN

DELIVERED BEFORE THE ROYAL COLLEGE OF
SURGEONS OF ENGLAND ON DECEMBER 8TH, 1921

BY

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MR. PRESIDENT—

I have the honour to speak to you this afternoon on the history of the Surgery of the Brain. My theme is so wide that I shall make no effort to touch the compass of it. I will try only to bring before you a few pictures of my subject at different epochs of time.

“The most important events of history are to the novelist what gigantic mountains are to the traveller. He surveys them, he skirts their base, he salutes them as he passes, but he does not climb them.”¹ In the same way I propose to survey, skirt, and salute some of the great landmarks in the history of the Surgery of the Brain.

We know that several races have arisen on the earth, have attained a more or less complex civilisation, have perished, and are now lost in the abysmal depths of geological time. The Neanderthal man is supposed to have lived about 60,000 years ago. It has been inferred from a study of his skull that his intellectual capacity was at least considerable. Of his life and work and the manner of his death we know nothing ;

¹ Alexandre Dumas, *Memoirs of a Physician*, vol. ii. chapter xix.

the words of the Preacher¹ being literally true :

The thing that hath been, it is that which shall be ; and that which is done, is that which shall be done ; and there is no new thing under the sun.

Is there anything whereof it may be said, See, this is new ? it hath been already of old time, which was before us.

There is no remembrance of former things ; neither shall there be any remembrance of things that are to come with those that shall come after.

A record of the science of astronomy and of the formulæ of mathematics may long remain on tablets of stone ; but I cannot imagine how the living processes of disease, and the clinical, chemical, bacteriological, and microscopical investigations, which have thrown so much light during the last fifty years on the abstruse problems of injury and disease, can be permanently recorded by any means we at present possess. Nothing has come down to us of the records of the past races even of historical time which suggests that they possessed scientific instruments of precision or means of intercommunication such as we now have.

We can hardly credit or in any way appreciate the loss of our complex surgical knowledge ; but I may ask the question : What

¹ Ecclesiastes i. 9, 10, 11.

would become of our present-day civilisation, and of our medical and surgical knowledge, if the Himalayas, the Alps, the Pyrenees, the Rocky Mountains, and the Andes were to sink into the depths of the sea, and the Atlantic and Pacific Oceans were to become dry land? Look forward 10,000 years, and I ask what record would then be available of our present knowledge of the intimate pathology of disease, and of the marvellous triumphs of surgery of our own day. Another question arises: Does the Neanderthal skull belong to a member of a race of men destroyed by some geological catastrophe, all news of which has been lost in that far-off unrealisable ancient time? In discussing the surgical knowledge of the ancients, I am anxious to guard myself against unduly assuming a knowledge of their ignorance, or of their accomplishments, which we do not possess. So slight is our outlook on the lives and actions of surgeons of the olden times, that we are apt perhaps to allot to them less than their due for the successful warfare which they waged against disease and death.¹

The difficulty of real knowledge of ancient things lies largely in the accident of our remoteness. We

¹ See note below Fig. 1, which shows a gladiator brought down by a wound of the femoral artery.

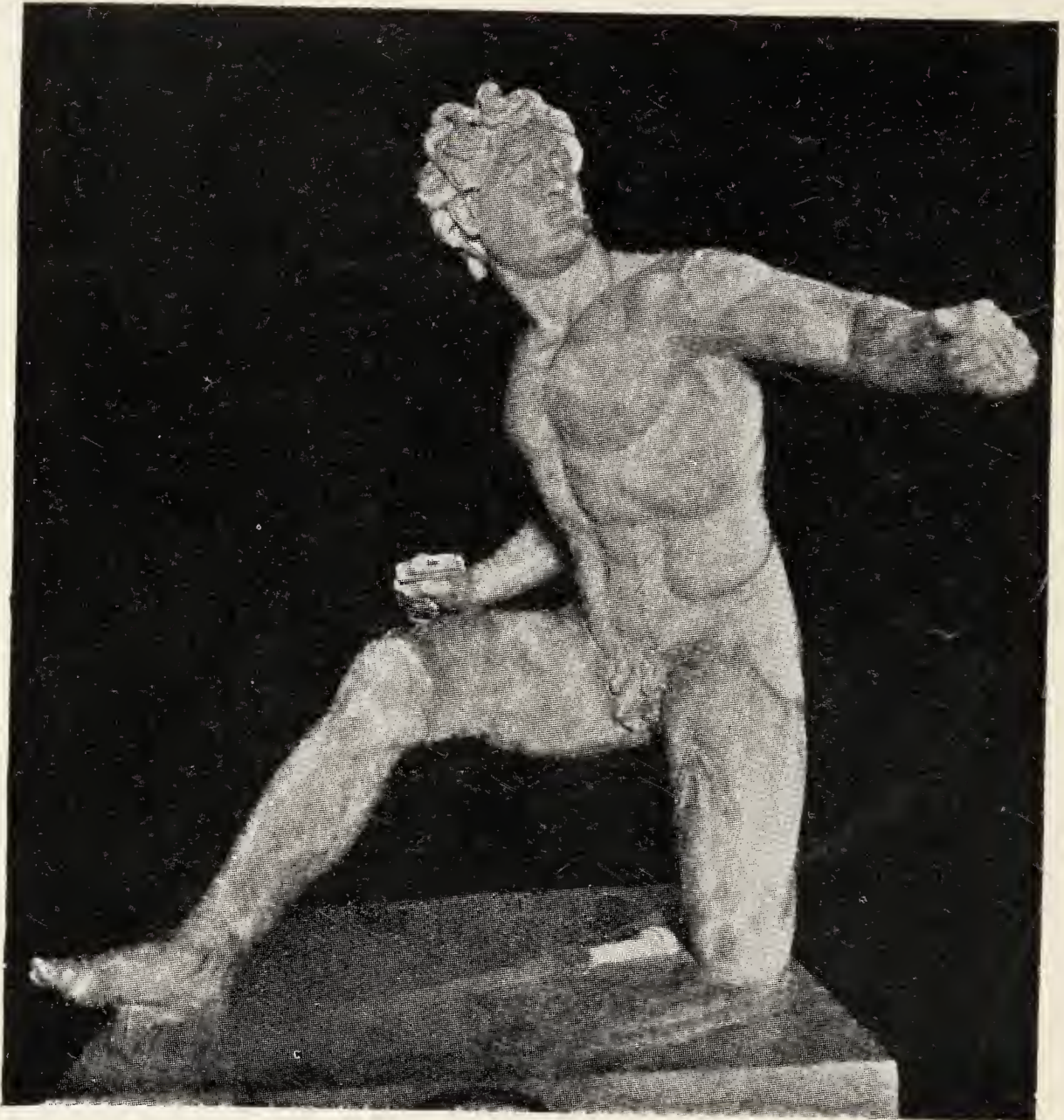


FIG. 1.—Photograph of a Greek Statue in the Louvre, representing a gladiator brought down by a small wound in the thigh.

The marble recalls the flat sheet of blood which would issue from a transverse wound of the femoral artery and suggests that anatomical and physiological knowledge guided the sculptor's hand. When a longitudinal wound is made in an artery the aperture as the blood escapes is nearly circular. On the other hand, if a transverse wound is made, no widening of the incision occurs, it remains linear and the blood escapes in a flat sheet. It is a well-known law, for cylindrical vessels, that the tension of their walls is directly proportional both to the fluid pressure and to the diameter, and that *the transverse tension is double the longitudinal*. Hence a transverse wound of an artery remains linear and the blood escapes in a flat sheet. It seems clear that the Greek sculptor was aware of these facts which were not generally known when I was a student.

stand very far off, and have to strain our eyes. For us the comparison of ancient and modern is largely a comparison of something half seen at a distance with something which we know intimately . . ., we see only the bold outlines, we are apt to miss the little lights and shades. . . . We have not the knowledge or the sympathy to catch, across the gulf of years, the peculiar thrill of what was once a "winged word" flying from soul to soul.¹

THE DAWN OF SURGERY.

Surgery is the oldest branch of the healing art, for injuries must have been common events in the life of our remote ancestors. As a tribe evolved into a nation some empirical knowledge of the effects of injuries and some skill in their treatment must have arisen, to be handed down by tradition to succeeding generations. No written record of this early tribal surgery has reached us, but the evidence of ancient skulls shows that trephining was practised in pre-historic times. The object of these early craniectomies can only be conjectured. Broca argued that they had a fanciful, ritual, or religious object, and was rather unwilling to believe that they were undertaken as therapeutic measures. Victor Horsley,² after careful examination of the skulls

¹ Gilbert Murray, *The Rise of the Greek Epic*, 1912, p. 27.

² *Journal of Anthropological Institute*, 1888.

in the Broca Museum at Paris in 1887, came to the following conclusions : (1) That the operative openings were nearly always to be found over the site of the representation of movement on the cerebral cortex ; (2) that the patients



FIG. 2.—Trépanation Néolithique. Crâne découvert dans une grotte sépulcrale de Nogent-les-Vierges et décrit par le professeur Hamy ; communiqué par le professeur Verneau. Pièce du Museum d'histoire naturelle du Jardin des Plantes. Photographie originale de M. Cintract. Énormes dimensions de l'orifice : 82 millimètres sur 60. (Lucas-Championnière.)

had probably been suffering from Jacksonian epilepsy ; (3) that the operation would gain a certain reputation for the cure of convulsions generally ; and (4) that at least some of the operations—*e.g.* for depressed fracture—would result in cure.

The late Prof. Lucas - Championnière,¹ who

¹ *Les Origines de la trépanation décompressive.*

made a profound study of the subject in a work published in 1912, gives an account of skulls bearing on the question, collected principally from the burying-grounds of the Incas of Peru, a nation of whose history nothing is known, and from caves and tumuli in various parts of France—some belonging to the Stone Age, others attributed to nations of ancient Gaul of a date not long before the dawn of Roman history. The number of skulls showing evidences of the operation which have been found is sufficient to prove that it must have been frequently performed, and the evidence of survival for a long period is in many instances quite clear.

Analogies with Surgery of Half-civilised Races of the Present Day.

Lucas - Championnière also investigated the operation as still practised by itinerant operators among certain half-civilised tribes, such as the Kabyles of the hinterland of Algeria, and showed that it presents many analogies with that of prehistoric times. He concludes that prehistoric trephining was undertaken as a *remedial* measure.

Not only do our recent therapeutic views justify the cranial therapy of the neolithic savage, but the observation of modern savages is well calculated to make us interpret in this way the operations of primitive

man. These openings must have been made in order to treat diseases which seemed to lie within the cranial

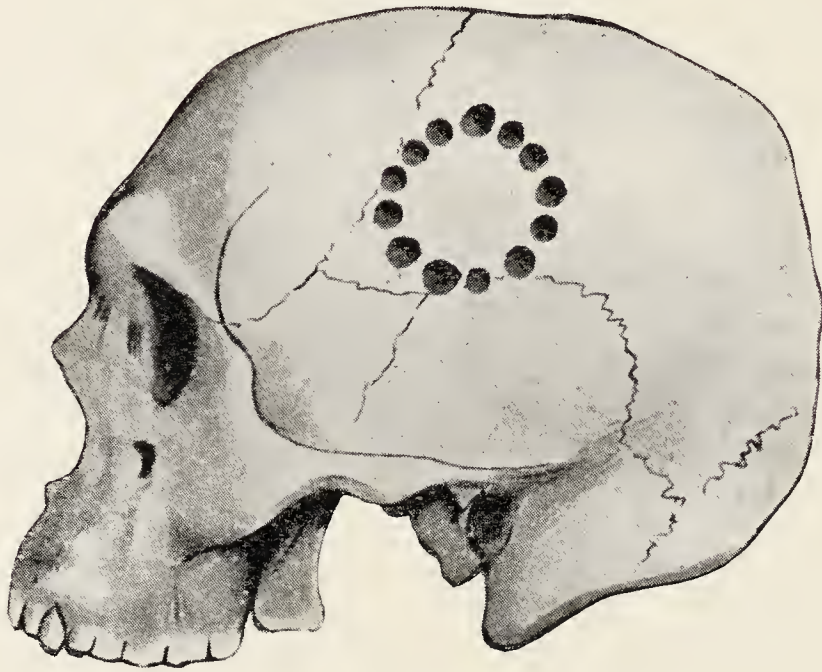


FIG. 3.—Schéma n° 1 montre la disposition des perforations. La disposition de ces perforations peut varier à l'infini pour donner la forme voulue à l'orifice, pour faire des orifices multiples se touchant ou à distance. Cette figure schématique et les suivantes ont été dessinées par le docteur Villandre.

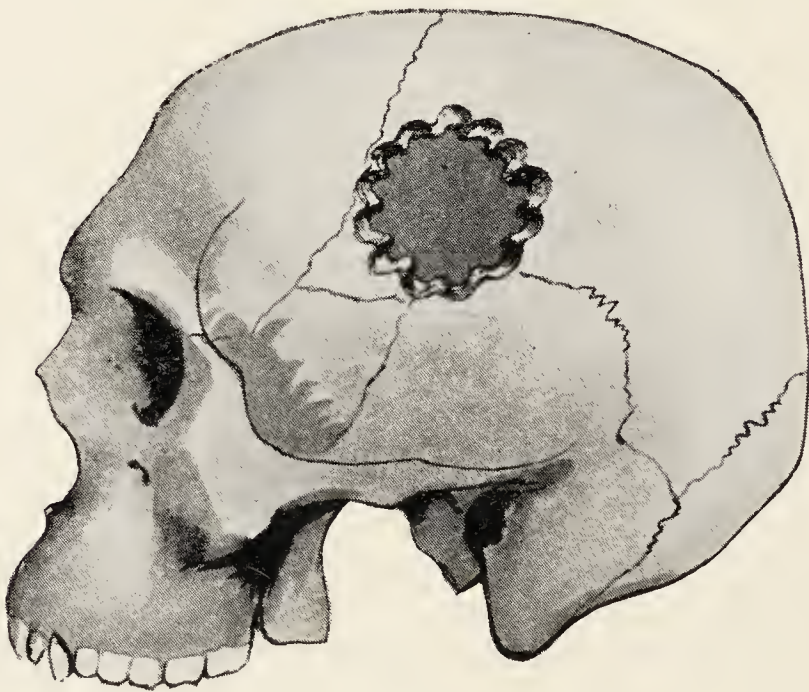


FIG. 4.—Schéma n° 2 montrant comment les perforations se touchent et permettent l'ablation d'une rondelle. Le schéma exagère les dentelures pour montrer le mécanisme de l'ablation de la rondelle.

cavity ; those of which the chief symptom was pain referred to the interior of the head. The trephinings were done to treat pain in the head which other measures did not succeed in alleviating. Considerable relief to pressure must have been afforded by the opening in the skull, and this must have been all the greater as the openings were often of large dimensions.



FIG. 5.—Schéma n° 3 pour montrer comment le passage du tranchant du silex peut égaliser la marge de l'orifice et lui donner l'aspect si caractéristique des trépanations néolithiques.

Figs. 3, 4, 5 are taken from Prof. Lucas-Championnière's treatise.

In short, a decompressive operation was done which we have only quite recently learned to do, and the value of which, even now, but few doctors appreciate.¹

¹ Lucas-Championnière seems to have forgotten that a decompressive operation, limited to the removal of a portion of the skull and without incision of the dura mater, is ineffective. The dura is a very strong, white, fibrous, inelastic membrane. Prof. Sherrington and I did a few experiments many years ago in order to determine how much more fluid would enter the intradural cavity after the removal of considerable portions of the cranium. The quantity of such fluid was extremely small, almost negligible ; and corresponded only to the unfolding of the dura when free of the eminences and depressions on the inner surface of the skull.

Lucas - Championnière also states that at the present day the operation is carried out amongst the Kabyles, the Montenegrins, and perhaps other peoples, as it was done in the Neolithic age ; and that it may still be studied in its original form unaffected by contact with the greater knowledge and altered practice of the civilised nations of Europe. In this country only two skulls have been found which illustrate primitive trephining.¹ In the island of Malta, which abounds in Neolithic remains, Prof. Zamit informs me that no skull has been found showing evidence of this operation—perhaps because few whole skeletons have been found, although great numbers of disarticulated human bones have been discovered. During my visit to Egypt (Christmas, 1920) Dr. Reisner, the American Egyptologist, told me that in the twenty years he had worked in Egypt he had not come across a trephined skull.

Mr. Colledge informs me that during a recent visit to Seville he saw in the museum a skeleton which had been removed from a Roman tomb. The left parietal bone showed a large healed opening evidently caused by a trephining operation. A most interesting account of trephining as at present practised in Algeria by the Shawia surgeons of the Aurès massive has recently been

¹ Wilson Parry, *Proc. R.S.M.*, Hist. Section, 1921.

published.¹ The trepanning was usually done for fractures of the skull. The instruments and drugs employed rather indicate that they entered the country in the wake of the Muhammadan conquest, or it may be that the operation was introduced during the Roman occupation.

It is indeed of surprising interest to note that thousands of years before trephining was deliberately employed for the treatment of organic disease of the brain a *decompressive craniectomy* was performed in many parts of the world as a therapeutic measure for pain in the head, for fits, for insanity (the Biblical disease “ possessed of the devil ”), and for fracture of the skull.

MESOPOTAMIA.

Mesopotamia is the site of the Scriptural account of the origin of man, and has been described as “ the nursery, if not the cradle of all culture,”² Babylon “ the glory of the kingdoms, the beauty of the Chaldees’ excellency,”³ and Nineveh, the “ exceeding great city ” of “ three days’ journey,”⁴ represent a phase, not the beginning of intellectual development. We know little of the surgery of these ancient nations,

¹ Captain Hilton-Simpson, *Among the Hill-folk of Algeria*.

² Neuberger, *History of Medicine*, vol. i. p. 11.

³ Isaiah xiii. 19.

⁴ Jonah iii. 3.

though the mention of certain fees for surgical operations (and penalties too) on Babylonian tablets seems to show that it was extensively practised.¹ The earliest mention of Babylon is in an inscription on a tablet ascribed to a date about 3800 B.C. The city suffered many vicissitudes, and in the year 689 B.C. was utterly destroyed by Sennacherib. It was gradually rebuilt, and in the reign of Nebuchadnezzar covered an area of more than 100 square miles. The wall surrounding it was in length about 50 miles, being 300 feet high and 85 feet broad, so that a four-horse chariot could turn on the top of it. The water-supply of Babylon was from a reservoir 40 square miles in extent; the houses of the city were three or four stories in height. It is scarcely conceivable that a city of magnificent buildings, with a record dating back 3000 years, should not have surgeons—men famous in the treatment of wounds and diseases.

EGYPT.

Of the surgery of the Ancient Egyptians little is known, but there is good reason to infer

¹ Neuberger, *ibid.* p. 18. About 2200 B.C. certain regulations were enforced: (1) "If a surgeon causes a severe wound with a bronze knife and cures his patient, he shall have 10 shekels of silver." (2) "If a surgeon causes a severe wound and the patient dies he shall have his hands cut off."

that they performed many operations and were expert in the treatment of wounds and fractures.

The Kingdom of the Pharaohs has left deeper traces upon the memory of mankind than that of Babylon. The culture of the valley of the Nile remains vivid on account of its intimate association with the civilisation of the Mediterranean nations. For thousands of years the majestic pyramids have kept fresh in the minds of countless races the golden age of the land of their birth.¹

Homer praises the high position of medicine in Egypt, saying of that country—

Whose prolific Nile
With various simples clothes the fatten'd Soil,
From Paeon sprung, their Patron-God imparts
To all the Pharian race his healing Arts.²

Herodotus declared Egypt to be the healthiest of countries. Notwithstanding the fine climate of Egypt, he says that the physicians were very numerous and were all specialists. What a happy family they must have been ! There was considerable intercourse, by no means always of a peaceful nature, between the Jews of Biblical time and the Egyptians ; some of the remedies mentioned in the Scriptures may have come from the Egyptian *materia medica*. During my visit to Egypt last winter I learned that poultices of figs, the remedy prescribed for King Hezekiah (who began to reign in 717 B.C.), are still in

¹ Neuberger, *ibid.* p. 19.

² *Odyssey*, iv. 320-25 (Pope).

common use in Egypt and Palestine. Again, in Proverbs¹ we read, “The blueness of a wound cleanseth away evil, so do stripes the inward parts of the belly.” Dr. Ali Bey Ibrahim told me that the people of Egypt commonly employed the method of congestion in the treatment of unhealthy wounds of the extremities by placing ligatures of various materials around the limb above the wound. Bier’s congestion method has probably been practised in Egypt for thousands of years. Another friend, Dr. Gorgy Sobhy, examined for me the oldest manuscript of the Proverbs, which is in Cairo. He found that the word translated “stripes” in the Authorised Version might mean also the cautery. The cautery is in constant use at the present time in Egypt for the treatment of abdominal ailments. Scars on the abdominal wall from the application of the cautery are commonly seen in the Cairo hospital. In Ecclesiasticus² the word *Rōphē* is translated in our version “physician.” It really means “healer,” but as the first healers were

¹ Chap. xx. 30.

² Chap. xxxviii. Dr. Cowley, Bodleian Library (private letter), writes : “The word *Rōphē* means a ‘Healer.’ In later times a distinction was made and a surgeon was called *Ūman*, which means a manual worker.” Prof. Myres writes that *Ūman* recalls the Homeric grouping of skilled labourers—*e.g.* the line

μάντιν ἢ ἰητῆρα κακῶν, ἢ τέκτονα δούρων

(wizard, or healer of illnesses, or shaper of spears.)

surgeons I use the word “ surgeon ” in the following beautiful language of the son of Sirach (180 B.C.) :

1. Honour the surgeon according to thy need of him with the honours due to him :
For verily the Lord hath created him.
2. For from the Most High cometh healing :
And from the King he shall receive a gift.
3. The skill of the surgeon shall lift up his head :
And in the sight of great men he shall be admired.
6. And He gave men skill,
That they might be glorified in His marvellous works.

GREECE.

Greek surgery is the earliest of which we have any definite record. The operation of trephining in the time of Hippocrates seems to have been carried out in an admirable manner. The use of wine and honey¹ in the treatment of wounds and the application of dry dressings were conducive to the success of the operations. There is ample evidence that the Greeks, in common with the other peoples of the “ orbis terrarum ” of the Mediterranean, and with the Eastern nations, inherited a whole system of medicine, pharmacy, and surgery from a remote ancestry. In Grote’s² time history began with the first

¹ Raw tar water, a crude kind of carbolic acid, was also used in the treatment of wounds (Berdoe’s *History of Medicine*, p. 177).

² *History of Greece*, 1846.

Olympiad (776 B.C.). To-day the origins of Greek civilisation go back to at least 3800 B.C. Recent investigations go to show that Crete, a kind of half-way house between two continents, was probably the starting-point of European civilisation. Indeed, the Minoan culture (3400–2000 B.C.) goes back to Neolithic man: the excavations already made lie over Neolithic strata which are of a date at least 9000 B.C.¹ It is possible, I think, that the more perfect methods of trephining practised by the Hippocratic surgeons had a direct and continuous descent from the primitive operations of the Stone Age.

Dr. Wace,² director of the British School at Athens, has recently described the wonderful discoveries at Mycenae. He says: “All research in this period (*circa* 1400 B.C.) helps us not only to write the earliest history of Greece, but to fill out, little by little, the background of Homer (900 B.C.). We now realise that Homer does not give us the first struggle of a rising Hellas, but the climax, or rather an epitome of the wonderful pre-Homeric Greece, of which even Athens in its prime knew little. Yet it was in the pre-Homeric days of the Bronze Age that the broad foundations of the glory of Greece

¹ See Garrison, *History of Medicine*, 1917, second edition.

² *Times Literary Supplement*, Oct. 13, 1921.

were laid. Long before history proper, Mycenae attained to a truly magnificent civilisation, far in advance of that which obtained in the centuries immediately following Homeric times. These centuries appear to have been a kind of dark age



FIG. 6.—Minoan Gold Cup. Sixteenth century B.C.

Figs. 6 and 8 are reproduced from the essay on Greek biology, and Figs. 7 and 9 from the essay on Greek medicine in Livingstone's *Legacy of Greece*, by kind permission of Dr. Singer.

in Greece, an interval of mediævalism, standing between the time of the ancient splendour and the birth of the classical period. There thus appears to be a rhythm in human affairs, an alternation of efflorescence, decay, and efflorescence again." The Golden Age of Cretan civilisation dates back from about 2000 to

1400 B.C.; that of Mycenae runs from about 1500 to 1300 B.C., and in both cases there was a long adolescent period farther back still. We have no knowledge yet concerning the surgery of the Golden Age of Crete or of Mycenae. Prof. Myres¹ suggests that "the reason is probably because no surgeon or surgical abode has been dug up yet. I found," he writes, "a curious votive clay figure at Petsofà, in Eastern Crete, showing the whole body bisected from the vertex downwards, as if to exhibit the organs inside." Is it possible that anatomy was in this way studied in those ancient times by means of frozen sections? It is certainly quite impossible to imagine the wonderful civilisations of Crete and of Mycenae without surgeons.

Aesculapius.

At present the history of Greek surgery commences with the story of Aesculapius. Cheiron, the wise centaur, taught the art of healing to Aesculapius. Pindar² tells the story of his education :

On some the force of charmèd strains he tried.
To some the medicated draught applied ;
Some limbs he placed the amulets around,
Some from the trunk he cut, and made the patient sound.

¹ Private letter.

² Pindar's Third Pythian Ode. Wheelwright's translation.



FIG. 7.—Asclepius or Aesculapius. (British Museum, fourth century B.C.)

BRITISH MUSEUM DESCRIPTION.

Head of Asclepius?

Colossal ideal bearded head. The hair falls in heavy masses over the forehead, and on each side of the head. A heavy metal wreath was fastened by numerous rivets, which still remain. The head was formed of three principal pieces of marble, the heaviest piece being so shaped that it kept its position by its own weight. The piece at the back of the head is lost. A small piece, which is now missing, was also attached behind the right ear.

This head would serve as well for Zeus as for Asclepius, and it is possible that this may have been the original intention of the artist. It was, however, discovered in 1828, in a *Shrine of Asclepius, in Melos*.

Parian marble. Height, 1 foot 11 inches. Two votive inscriptions to Asclepius and Hygieia were discovered with the head. One of these, with a votive relief of a leg, is now in the British Museum (No. 809).

Aesculapius became so proficient in the healing art that Pluto accused him of diminishing the number of the Shades, and thereupon Zeus destroyed him with a thunderbolt.

The story of Aesculapius has no doubt some facts for a basis. It dates from about 1250 B.C., and Aesculapius is described as a chieftain of Thessaly. He had two sons who became famous as army surgeons, and there was probably a continuous tradition of surgical knowledge from the time of Aesculapius to that of Hippocrates. After his death Aesculapius was worshipped as a divinity all over Greece ; his temples, built for the most part on wooded mountain slopes near mineral springs, became popular sanatoria. The priests carried on the surgical tradition ; temple cures were not uncommon. How did the priests produce anæsthesia—by draughts, by inhalation of narcotic drugs, or by hypnosis ? A patient with an abscess in the abdomen is operated on ; he is assured that all is a dream and departs cured, but with the tell-tale comment, “ And the floor of the abaton was covered with blood.”¹

¹ Dr. Charles Singer's chapter on Greek Medicine in Livingstone's *Legacy of Greece*, p. 223.

Early Anæsthetics.

The artificial induction of painlessness by narcotic draughts was traditionally known in ancient times. The Chinese were acquainted with general anæsthesia thousands of years ago. It is related of the surgeon Hoatho in the third century A.D. that he performed amputation, trephining, and other major operations by its aid.¹ Dr. Browne² relates two cases of anæsthesia taken from a Persian manuscript. The first story concerns Aristotle and an Indian surgeon named Sarnab. An earwig had entered the patient's ear and attached itself to the brain. Aristotle gave the patient a drug so that he became unconscious while Sarnab trephined the skull. This was excellent treatment. It is now well known that living foreign bodies may produce otitis and meningitis. In the second case the operation was Cæsarean section, and wine was the agent which produced unconsciousness.

Homeric Surgery.

Homer lived about 900 B.C. Homeric surgery is naturally chiefly descriptive of the treatment of wounds; the clinical signs and symptoms

¹ Neuberger, p. 72.

² FitzPatrick Lectures, 1921, p. 79.

of injuries—*e.g.* the signs and symptoms of wounds of the heart—are well described. Those of my audience who are fond of shooting may have seen a rabbit or a hare, when shot, spring into the air and spin round on its longitudinal axis before becoming motionless. In such a case



FIG. 8.—Head of Horse. (From Parthenon, 440 B.C.)

The Greek horse had no forelock trained down over the forehead.

a pellet would be found to have injured the cerebellum. In the *Iliad*, Book VIII., the horse of Nestor is wounded in the brain by an arrow shot from the bow of Paris. “In agony the horse sprang into the air as the missile passed into the brain. The team was thrown into confusion by the rolling of the wounded horse on the ground.” I think it possible that the

cerebellum of this horse was wounded. It is not stated whether Paris was behind or in front of the horse when the arrow sped from his bow. If he was in front the arrow probably pierced the weak spot in the middle line on the vertex of the skull where the mane commences. This is some inches behind a transverse line joining the two orbits. On examining an antero-posterior median section of the brain and skull of the horse it is seen that a dart or arrow, travelling by the side of the falx, might reach the cerebellum by this route. The cerebellum of the horse is large as compared to the cerebrum. If, on the other hand, the arrow entered behind the ear, thicker bone would have to be traversed before the cerebellum could be wounded.¹

Arctinus of Lesbos (770 B.C.), a pupil of Homer, is the first Greek poet of whose personality² we are certain. He reveals a clear distinction between medicine and surgery.

Then Aesculapius bestowed the power of healing upon his two sons ; on one did he bestow the lighter hand, that he might draw missiles from the flesh, and sew up and heal all wounds ; but the other he endowed

¹ Prof. Myres writes : “ Nestor’s horse was struck by an arrow (line 81) shot by Paris upon the top of his crown (or Latin vertex) where the first hairs of a horse grow upon the cranium and a wound here is most mortal.” The forelock of an English horse is trained downwards between the eyes, but this was not done in ancient Greece. Greek horses had no forelock.

² Withington, *Medical History from the Earliest Times*, 1894.

with great precision of mind ; so as to understand what cannot be seen, and to heal seemingly incurable diseases.¹

Hippocrates.

About four centuries after Homer Hippocrates lived and worked. He is believed to have been descended from Aesculapius, and through his mother from Hercules. It is certain that he was a member of the family of the Asclepiadae, the pioneers of scientific medicine and surgery. The prophecy of Daniel,² "Many shall run to and fro, and knowledge shall be increased," was little more than fifty years old at the time of his birth. He lived in a great age and had for contemporaries Pericles the famous statesman, the poets Aeschylus, Sophocles, Euripides, Aristophanes, and Pindar, the philosopher Socrates and his distinguished disciples Plato and Xenophon, the venerable father of history Herodotus and his young rival Thucydides, the unrivalled sculptor Phidias, and many other distinguished men. The philosopher Aristotle, who was a pupil of Plato, was of the next generation. This group of famous men conferred immortal honour on the times in which they lived, and exalted the dignity of human life and work. At this period,

¹ Quoted from Berdoe's *Origin and Growth of the Healing Art*.

² Daniel xii. 4.

too, other regions of the earth were remarkable for moral and intellectual development, for the religions of Confucius (550–478 B.C.), Gotama Buddha (600–500? B.C.), and Zoroaster (1000? B.C.) were flourishing during the Hippocratic era.

It is the unique distinction of the Greeks among the nations of antiquity, that they practised a system of medicine based not on theory but on observation accumulated systematically as time went on. The claim can be made for the Greeks that some at least among them were deflected by no theory, were deceived by no theurgy, were hampered by no tradition in their search for the facts of disease, and in their attempts at interpreting its physical phenomena. . . . The Hippocratic writers remain, for the most part, patient observers of fact, sceptical of the marvellous and the unverifiable, hesitating to theorise beyond the data, yet eager always to generalise from actual experience ; calm, faithful, effective servants of the sick.¹

Whatever personal contributions Hippocrates made to knowledge, and they were no doubt many and important, he took in all that had been done before, selected the valuable from the worthless, and gave to surgery an existence as a science independent of superstition and the sophistries of philosophers. The collection of writings known as the Hippocratic treatises (*Corpus Hippocraticum*), which happily survived

¹ Charles Singer, *ibid.*

the wreck of ancient literature, not only enables us to form a fairly accurate conception of the practice of surgery in that period, but is the foundation of medical literature, and held undisputed sway for several centuries. Hippocrates probably knew all that could be known by clinical observation without the aid of instruments of precision and without accurate knowledge of anatomy, physiology, and pathology. To what literature he may have had access we do not know, for pre-Hippocratic Greek medical writings have perished.

The superstitions entertained by the Greeks respecting their dead prevented, it has generally been thought, the Hippocratic surgeons from practising dissection, but perhaps they followed the plan of the Arabs :

The celebrated Yuhanna being unable to obtain human subjects dissected apes in a special dissecting-room which he built on the banks of the Tigris. A particular species of ape considered to resemble man most closely was by command of the Caliph supplied to him about the year A.D. 836 by the ruler of Nubia.¹

Dr. Adams writes : ²

It is certain that by some means or other Hippocrates dissected. The language of our author in this

¹ Dr. Browne, *Arabian Medicine*, p. 37.

² *The Genuine Works of Hippocrates*.

place (on dislocation of the shoulder) puts it beyond doubt that human dissection was practised in his age.

There is no doubt, in fact, that a great deal more human dissection went on than Greek doctors dared to acknowledge for fear of exciting popular prejudice. Less than 100 years after the death of Hippocrates there was abundant and open dissection of the human body in the schools of Alexandria.¹

Of the man Hippocrates we know little ; we speak of him as the father of medicine, and he is also the father of surgery.

The glimpse that we have of Hippocrates is very dim and distant,² yet we cannot exaggerate the influence on the course of medicine and the value for physicians of all time of the traditional picture that was early formed of him, and that may indeed well

¹ See Berdoe's *Origin and Growth of the Healing Art*, 1893, p. 174.

² In a remarkable and learned work entitled *The Quest of the Historical Jesus*, by Albert Schweitzer, privat-docent in New Testament Studies in the University of Strassburg, translated by Drs. Burkitt and Montgomery, 1911, p. 399, there is the following passage : " We are experiencing what Paul experienced. . . . ' If we have known Christ after the flesh yet henceforth know we Him no more.' And further we must be prepared to find that the historical knowledge of the personality and life of Jesus will not be a help, but perhaps even an offence to religion. The truth is, it is not the historical Jesus, but the Spirit which goes forth from Him, and in the spirits of men strives for new influence and rule, is that which overcomes the world." I think, without irreverence, we may say that this is true in some measure also of Hippocrates. The personality and personal details of the life of Hippocrates are not the supreme legacy which this great Grecian left to the medical men of all time. It is rather the moral perfection of his teaching which is a beacon light in every age to the pilgrim student of medicine and surgery.

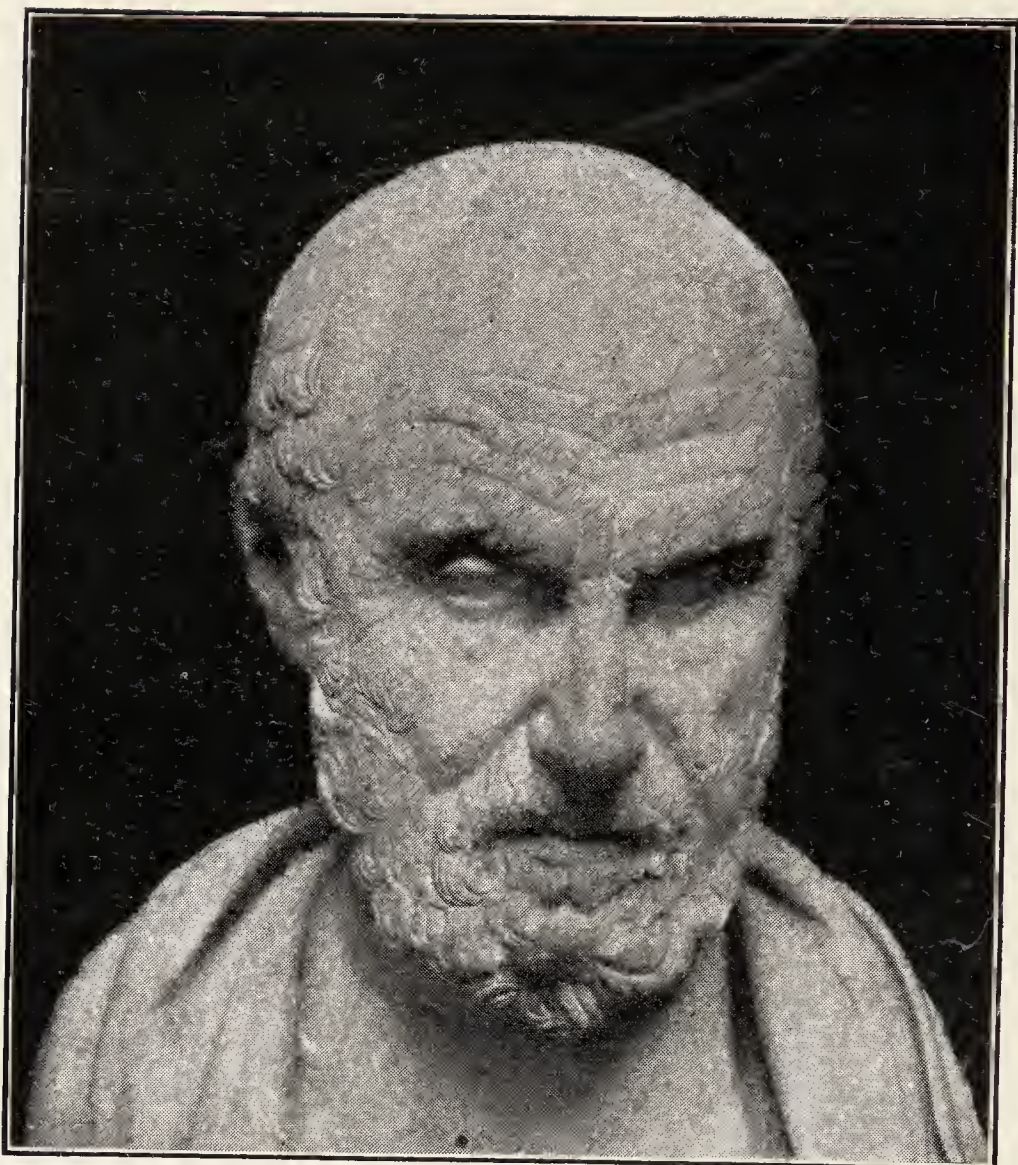


FIG. 9.—Hippocrates. (British Museum, second or third century B.C.)
 “The Father of Surgery.”

A saying of Hippocrates—“Science and belief are two things; the one begets knowledge, the other ignorance.”

“The numerous busts of Hippocrates are no portraits. They are idealised representations” (Dr. Singer).

BRITISH MUSEUM DESCRIPTION.

Bust, known as “Hippocrates.”

The bust is a portrait of an elderly man, nearly bald, with short curling beard, with heavy brows and wrinkled forehead. A (modern) piece of drapery passes over the shoulders.

The portrait is one of which several replicas exist. The type has been called Hippocrates since the middle of the eighteenth century. It has a certain resemblance to the head of Hippocrates on coins of the island of Cos (the birthplace of Hippocrates), but it obtained its name because it happens to have a decided resemblance (*e.g.* in the wrinkles on the forehead) to a free rendering of the coin in the *Imagines* of Gallaeus and Faber. It is also worthy of notice that in the *Life of Hippocrates* attributed to Soranus, it is said that his portraits usually have the head covered. This, however, does not hold good of the coin, but the realistic character of the bust proves that it is not a fifth-fourth century type.

Recently the head has been identified (by Gercke) with a portrait (often called Aratus) on the coins of Soli, but the resemblance is less marked than that mentioned above.

Parian marble. Height, 1 foot 6½ inches. Restored: nose, upper part of left ear, neck, and bust with drapery. This bust was found with No. 1831 on the supposed site of the villa of Terentius Varro Murena.

be formed again from the works bearing his name. In beauty and dignity that figure is beyond praise. Perhaps gaining in stateliness what he loses in clearness, Hippocrates will ever remain the type of the perfect physician. Learned, observant, humane, with a profound reverence for the claims of his patients, but with an over-mastering desire that his experience shall benefit others, orderly and calm, disturbed only by anxiety to record his knowledge for the use of his brother physicians, and for the relief of suffering, grave, thoughtful, and reticent, pure of mind and master of his passions, this is no overdrawn picture of the Father of Medicine as he appeared to his contemporaries and successors. It is a figure of character and virtue which has had an ethical value to the medical men of all ages comparable only to the influence exerted on their followers by the founders of the great religions.¹

Hippocrates has been described—

as a shining example of philanthropy and professional faithfulness ; a seeker after truth with full consciousness of its being unattainable. He overcame time and still exercises upon mankind a wonderful unbroken power by means of his temperate observations, his far-seeing methods and his therapeutic principles, which derived from Nature, and opposing no progress, are themselves unsurpassed. He resembles a spring with many streams, vivifying and inexhaustible. Admired by all, understood by few, imitated by many, equalled by none, he was the master of medicine for all time.²

¹ Dr. Singer, *ibid.* p. 212.

² Neuberger, *ibid.* p. 137.

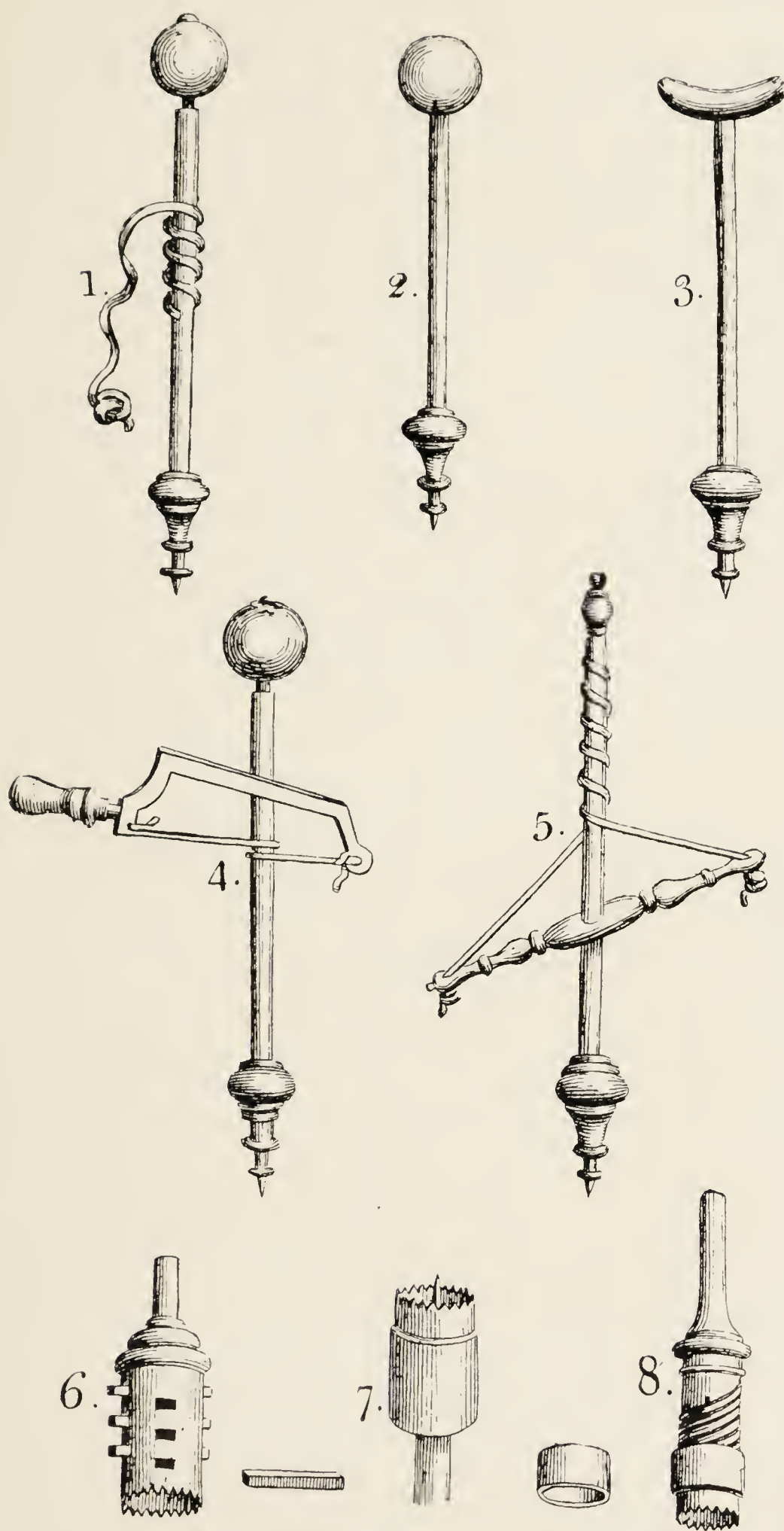
Examples of Hippocrates' Technical Knowledge.

Hippocrates' knowledge¹ of the varieties and clinical signs of injuries to the head seems to have been very complete, and his method of trephining the skull was not inferior to that practised at the present day. He employed a collar on the trephine to prevent it penetrating too deeply, a plan which has only recently been reintroduced. In some cases he recommended operation in order to "*slacken the tightness of the head,*" in other words, to decompress in cases of inflammation, and to allow of the escape of blood or matter, and to remove foreign bodies. He was aware of the danger of infection of the bone from inflammation of the soft parts, and in those cases he recommended free incision of the scalp. He recognised that a blow on one side of the head sometimes was followed by convulsions or paralysis of the opposite side,² and in hernia cerebri he used drying applications and gentle pressure.

Hippocrates recommended the use of the trephine as a cure for blindness without evident disease of the eye, and may have seen and relieved cases of optic neuritis from intracranial disease.

¹ *The Genuine Works of Hippocrates*, by Francis Adams, 1849, vol. i., *Injuries of the Head*, pp. 421-466.

² *Epidemics*, par. 35 (Littre, vol. v. p. 405).



1.2.3.4.5. *Guarded Terebræ.*
 6.7.8. *Guarded Modioli.*

FIG. 10.—Reproduced from the essay on injuries to the head by Percivall Pott (*Chirurgical Works*, vol. iii. 1771). The figures representing terebræ (trephans) were taken by Pott from Vidus Vidius's translation of Hippocrates' essay on injuries of the head.

The guarded modioli (trephines) were copied probably from Andreas a Cruce's work (*Chirurgiae universalis opus absolutum*, 1596). There are numerous illustrations in this book. Modioli are shown on p. 15 guarded by a bar or collar. The centre-bit terebra is seen on p. 13 (see Figs. 11 and 12, p. 33 of this lecture). In all the old works on surgery the smaller terebræ are seen guarded with a ring of metal so as to limit penetration.

The passage is in the book *On Vision* (Littré's translation, vol. ix. p. 159) :

When sight fails without apparent disease of the eyes an incision should be made in the parietal region, the soft parts reflected, the bone trephined and the fluid beneath let out—that is the treatment, and it is thus these patients get well.

It would seem that Hippocrates must have opened the dura and obtained a flow of cerebro-spinal fluid. Decompression is not effectual without incision of the dura. Operation is also suggested in certain acute conditions, probably meningitis (Littré, vol. vii. p. 29). The seed dropped by Hippocrates did not germinate in regard to the treatment of amaurosis without visible ocular disease, and in regard to meningitis till our own time some thirty years ago.

Hippocratic Trepan and Trephines.

Figs. 10, 11, 12 show ancient trepans and trephines from the works of Percivall Pott, Peter Paaw, and Vidus Vidius. The two latter surgeons translated under the title “*de Vulneribus Capitis*” the essay of Hippocrates on injuries of the head.

Francis Adams (1849) translated into English the *Genuine Works of Hippocrates*, including the

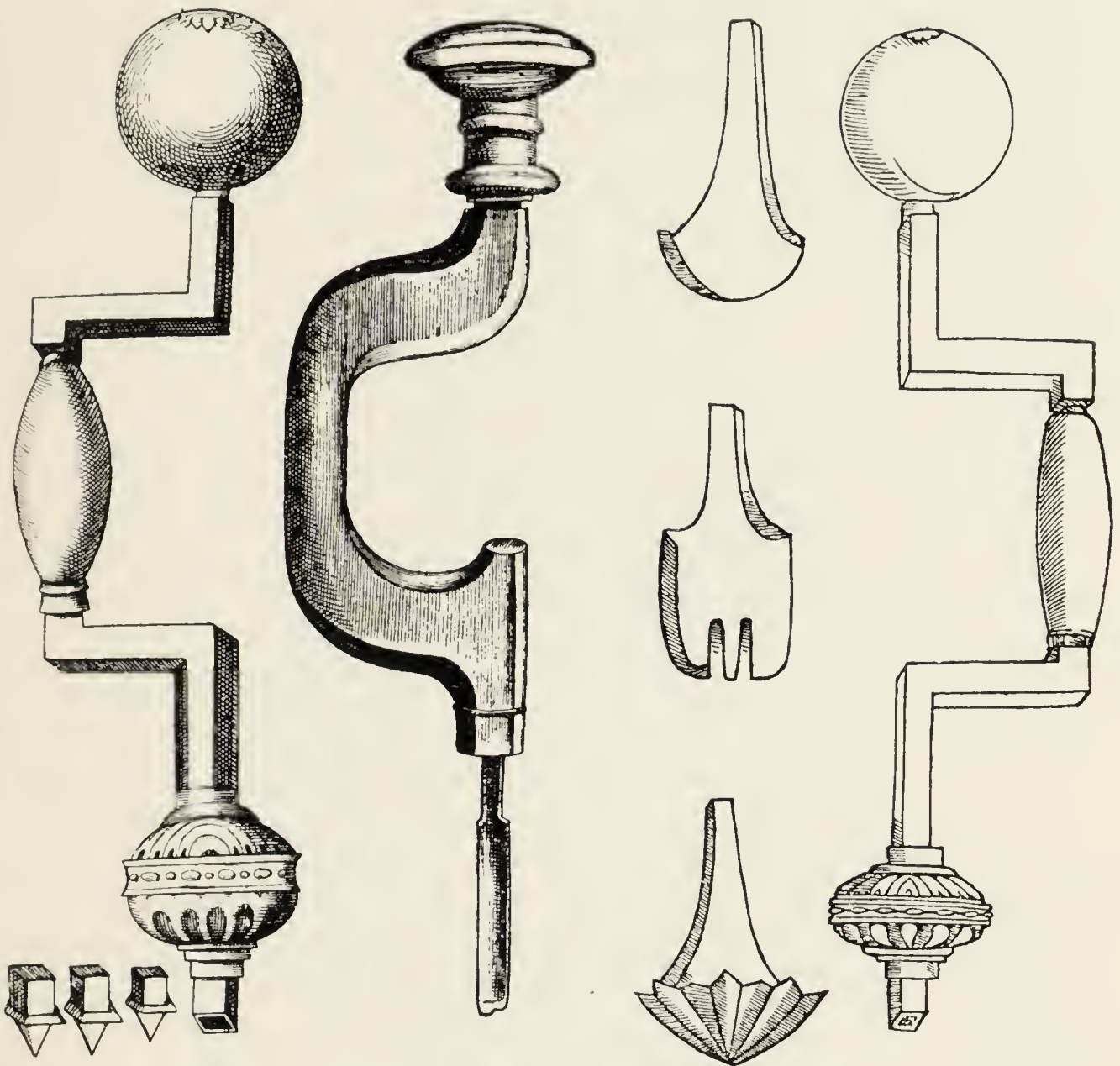


FIG. 11.—*Ancient terebra*, illustrating and reproduced from the translation by Peter Paaw (d. 1617) of the essay by Hippocrates on injuries of the head (*Commentaria in Hippocratem de vulneribus capitis*, 1616). This trepan, which is like the centre-bit of a carpenter, is seen on p. 224. On p. 225 is figured an ancient modiolus guarded by a collar. On p. 118 are shown a scalper planus or chisel and a scalper cavus or gouge.

FIG. 12.—*Ancient terebra* illustrating and reproduced from the translation by Vidus Vidius (d. 1569) of the essay by Hippocrates on injuries of the head (*Chirurgia è Graeco in Latinum conversa, Vido Vido interprete lutiiae Parisiorum*, 1544, chap. 61, p. 122). This trepan is like that seen in Peter Paaw's translation and presumably must have been copied from the same Greek manuscript. Other instruments figured are an unguarded trephine, a mallet and chisel, and on several pages are figures of ancient trepans like those shown in Fig. 10.

essay on the injuries of the head. Adams's translation is illustrated by figures of ancient trepans and ancient trephines (vol. i. plate 2). Adams copied these figures from the work of Percivall Pott and Vidus Vidius. In Pott's volume, on pages 154 to 164, is a discussion of the ancient methods of trepanning and trephining, and extracts are added from the following ancient authors as footnotes : Hippocrates, Galen, Oribasius (326-403), Albucasis (tenth century), Brunus (his *Surgery* was published in 1619), Vidus Vidius, Peter Paaw, and Andreas a Cruce.

Pott writes :

All the instruments were formed on the same principle, viz. to perforate the skull without injuring the membrane underneath. The cautions of Hippocrates caused the best practitioners to furnish their perforating instruments with such guards or defences as should prevent them from going too deep. The observations of our remote ancestors were in general extremely just and true.

In Fig. 10 it will be seen that the modiolus is furnished with a collar or bars to limit the depth to which it can perforate. In some cases "the piece of cranium intended to be taken away was surrounded with perforations made at small distances from each other, and the interstices were cut through by chisel and mallet or by means of a scalper." (This is the method of the Neo-

lithic surgeon, and it is of great interest that the Greek surgeon followed the same plan.)

There is no doubt that Hippocrates used the trephine, and that various sizes were available (Milne, *Surgical Instruments in Greek and Roman*



FIG. 13.—Petrus Paaw.

Medicinæ Professor.

Times, 1907, pp. 131, 132). Milne quotes two passages from Hippocrates which are quite clear on this point, and another from Celsus which gives a description of the instrument and the method of its application and use.

Paulus of Aegina (early part of seventh

century), whose works were translated by Francis Adams (1846), mentions (vol. ii. p. 440) the *terebræ* and *modioli* of the ancients ; the latter he does not favour. Adams in the commentary contrasts the practice of Hippocrates, Galen, and Celsus in injuries of the cranium. He quotes from Rhazes, Avicenna, and Albucasis, and adds that the Arabians were timid operators. He states (p. 440) that Albucasis gives drawings of surgical instruments used by the ancients in operations on the head ; they were spear-shaped instruments having a globular ball a short way above the extremity ; they had no resemblance to a modern trephine.

How did Peter Paaw, Vidus Vidius, and Andreas a Cruce obtain illustrations of instruments used by Hippocratic surgeons for operating on the skull ? It would seem that they must have had access to Greek manuscripts treasured by the Arabs or to Arabic translations (with illustrations) of Greek manuscripts or possibly to Greek manuscripts treasured in the monasteries during the dark ages : the 1000 years of disorder and chaos which followed the Galenic period.

I have not found in the works of Oribasius who lived in the fourth century (the R.C.S. library has three editions of Oribasius, dated

1533, 1537, and 1735) or in the works of Paulus Aegineta who lived 300 years later (the R.C.S. library contains editions of Paulus dated 1532, 1538, and 1589, and the translation of Adams, 1844) any illustrations of trepans or trephines. In the tenth century Cordova produced the greatest surgeon of the Arab race, Albucasis ; but in those of his works, to which I have had access (*La Chirurgie d'Albucasis*, with plates, translated by Dr. Lucien Leclerc, Paris, 1861, and *Albucasis de Chirurgia Arabice et Latine*, 1778 : Johannis Channing), I have only found figures of the spear-shaped terebræ referred to above.

PERSIA : THE ALEXANDRIANS.

How far Greek medicine was a purely indigenous product or to what extent it was influenced by Eastern knowledge we do not know. The Greeks penetrated into Egypt and the East before the time of Hippocrates ; but there were no international congresses in those days, and nations became acquainted principally by the method of invasion and conquest. The Greeks in the seventh century B.C. encountered the decline, not the zenith of Egyptian medicine ; the highest development of the latter is to be referred to about 2000 B.C. With the break-up

of the Roman Empire intellectual darkness fell on the Graeco-Roman world, but the last sparks of Grecian knowledge were kept burning by the Persians. The story of Demokedes related by Grote¹ shows that as early as the days of Darius (550 B.C.) the Persians were acquainted with Greek surgeons. The later knowledge of the Graeco-Roman period came to them from the Nestorians expelled from Constantinople for heretical opinions in the fourth century A.D. The ruler of Persia hospitably received the exiles and caused the best Greek, Latin, and Indian works to be translated into Persian. The lasting service rendered by Persia was in giving a home to Greek medicine and surgery ; the knowledge thus preserved was passed on to the all-conquering Arabs.

When Greece lost her intellectual supremacy, with her national independence, the centre of literature, philosophy, and science was shifted to Alexandria. This city was founded by Alexander in 331 B.C., and after his death it fell with the Egyptian portion of his empire to Ptolemy Soter (280 B.C.). Under this monarch the famous school was founded where anatomy was systematically studied by dissection and it is alleged also by human vivisection. Herophilus and

¹ *History of Greece*, vol. iv. p. 342.

Erasistratus were the great professors of Alexandria : they are many times mentioned by Celsus, and the name of Herophilus is immortalised in anatomical nomenclature ; but the whole of the writings of the Alexandrian school are lost, except for a few fragments in the works of later authors. The Imperium Romanum is more noted for military science, civil engineering, and law than for the healing art. Greek surgeons were, however, of great repute in ancient Rome.

CELSUS.

After Hippocrates the next great period in the history of surgery is that of Celsus and Galen. Between Hippocrates and Galen, an interval of five centuries, flourished the great Alexandrian school. Our only important source of information concerning the surgery of the Alexandrian period is Celsus (30 B.C.), who lived in the reign of Tiberius. From Celsus we infer that the brilliant anatomy of Alexandria made for good practice in surgery and for advance in surgical diagnosis. He describes the operation of trephining and expresses the opinion that in some cases it must be done even when there is *no fracture of the skull*. “It sometimes,” he says, “though rarely happens that the bone

remains intact, and that owing to a rupture of a vessel of the dura mater blood is effused beneath the bone, and there coagulates and causes great pain and dimness of vision. Nearly always the pain is over the site of the clot, and here the bone should be trephined.”¹

GALEN.

Galen, like Celsus (A.D. 150), owed much to his knowledge of the Hippocratic writings and to the human anatomy which had been taught in the Alexandrian schools. He is the most voluminous of the ancient writers, but all his life he was engaged in research in anatomy, physiology, and surgery. He had a difficulty in obtaining subjects in Rome for dissection, and had to send his students to Germany to dissect the bodies of enemies slain in battle—just as Lord Lister had to go to Toulouse to perform certain experiments to escape being subject to the criminal law of England.

As far as we know, Galen was the first and only experimental physiologist before Harvey. He divided the nerves—*e.g.* he produced aphonia by cutting the recurrent laryngeal ; he divided the spinal cord at different levels, and removed

¹ Book viii. chap. 4.

portions of the brain, so obtaining definite results concerning the cause and seat of various paralyses. Both Celsus and Galen used the ligature for the arrest of hæmorrhage and the cure of aneurysm ; and Galen tells us he obtained both silk and



FIG. 14.—Aulus Cornelius Celsus.

“ Admirabilis Celsus in omnibus, quem nocturna versare manu, versare diurna consulo ” (Fabricius of Aquapendente, 1537–1619. *Opera Chirurgica*, 1620). See Védrené's Introduction to his translation of Celsus, 1876.

catgut ligatures in a shop in the Via Sacra in Rome.

The natural outcome of the Alexandrian anatomical studies was the ligature of arteries for wounds and aneurysm. Is it conceivable that these great surgeons, Celsus and Galen,

were wholly ignorant of the physiology of the vascular system? Is it not more likely that as Ambroise Paré¹ rediscovered, in 1570, the use of the ligature “by the special favour,” as he says, “of the Sacred Deity,” so Harvey,² in 1618, re-demonstrated to the modern world what had been understood, though perhaps only dimly, by Celsus and Galen? How could Celsus have written *Sanguinis cursus revocetur* without having some idea of a blood current? In another place Celsus advises tying vessels during an operation before dividing them. Why should he give this advice if he knew not that the blood coursed through the arteries?

The knowledge collected in the Alexandrian schools was in great part lost in the burning of the Alexandrian libraries,³ in the burning of the royal library of Tripoli,⁴ and in the wars and

¹ “The Works of that famous Chirurgeon Ambroise Parrey, translated out of Latin, and compared with the French, by Thomas Johnson, London, 1634,” book x. chap. 17.

² *De motu cordis et sanguinis*.

³ Gibbon's *Roman Empire*, notes by Dean Milman, 1887, vol. iii. note to p. 417. Apparently there were originally two libraries in Alexandria; one was destroyed by Julius Caesar 47 B.C., and the other, called the Bruchium, is said to have been destroyed by the Emperor Aurelian in suppressing a revolt A.D. 273. If this is correct, “the library destroyed A.D. 640 in the royal palace and in the temple of Serapis no longer contained the 400,000 or the 700,000 volumes in MS. collected by the Ptolemies” (vol. vi. p. 337), but may have contained some MS. saved from the previous conflagrations and newly collected works.

⁴ A.D. 1109. Gibbon, vol. vi. note to p. 338: “The library of Tripoli is said to have contained the incredible number of 3,000,000 of volumes. On the capture of the city, Count Bertram of St. Gilles, entering the first

tumults of the early centuries after Christ. At first sight it is a matter of wonder that we know as much as we do of ancient times, for, as Dean Milman remarks, the whole state of the known world at that period seems to offer no more secure footing to an historical adventurer than



FIG. 15.—Claudius Galen.

The first experimental Neurologist.

the Chaos of Milton. From the date when the learning of Alexandria was lost till the rise of the famous sixteenth-century school of anatomists a period of 1000 years passed by during which the spirit of man was content without anatomical or physiological inquiry.

room, which contained nothing but the Koran, ordered the whole library to be burnt, as the works of the false prophet of Arabia.”

THE ARABS.

It is essential in relation to the history of surgery to catch the character and spirit of the age from which the example is drawn.

In the light of history the present and the future may be interpreted and guessed at. For though the whole meaning lies far beyond our ken, yet in that complex manuscript, here and there, still dimly legible, an intelligible precept available in practice may be gathered.¹

Such Greek surgical learning that survived the general wreck of knowledge was preserved by the Arabs, and in Europe in the monasteries. The wonderful conquests of the Arabs in the seventh century were followed by an intellectual activity hardly less wonderful. Dr. Browne, the professor of Arabic at Cambridge, in his *Fitz-Patrick Lectures*, pp. 6 and 67, has told a story of surpassing interest.

A Byzantine Emperor was astounded to find that the right of collecting Greek manuscripts was among the terms dictated by a victorious barbarian. The Muslims were the faithful transmitters of Greek surgery. It is doubtful whether they added anything to it. During the Golden Age of Arabian learning between A.D. 750 and 850 the Muhammadan Empire extended from Baghdad on the Euphrates, to Andalusia in Spain on the banks of the Guadalquivir. The

¹ Carlyle on History.

Caliphs by purchase, conquest, and exchange possessed themselves of countless precious manuscripts which they caused to be translated. Of the books enumerated in the Index (A.D. 987) it is not an exaggeration to say that not one in 1000 now exists. The Mongols, "that detestable nation of Satan," poured forth like devils from Tartarus and did their work only too thoroughly.¹

The destruction of the Arabic collection of manuscripts in the Library of Wisdom at Baghdad (A.D. 1258) can only be likened to the burning of the libraries of Tripoli and Alexandria.

Mediæval European Medicine and Surgery.

In our own country and in the other European provinces of the Roman Empire such learning as survived was preserved in the monasteries; the learned order of Benedictines seems to hold

¹ Dr. Browne, *ibid.* p. 33: "The teachings of the most eminent physicians of Ancient Greece, notably Hippocrates, Galen, Oribasius, Rufus of Ephesus, and Paul of Aegina, by the diligence and learning of the great translators were rendered accessible to the Muslim world." P. 19: "It was in the middle of the eighth century of our era, and through the then newly-founded city of Baghdad, that the great stream of Greek and other ancient learning began to pour into the Muhammadan world, and reclothe itself in an Arabian dress." P. 67 (quoted from Withington's *Medical History*): "The philosophers of Constantinople were amazed by the appearance of Muslim writers, whom they styled with reluctant admiration 'learned savages,' whilst the less cultured Christians soon came to look upon the wisdom of the Saracens as something more than human. It was this people (the Arabs) who now took from the hands of unworthy successors of Galen and Hippocrates the flickering torch of Greek medicine. They failed to restore its ancient splendour, but they at least prevented its extinction, and they handed it back after five centuries burning more brightly than before."

the chief place in monastic medicine. Benedict, the Saint of Subiaco, founded the monastery of Monte Cassino in 542, and from this the medical school of Salerno is said to have originated.¹ The centuries which immediately followed the establishment of the school of Salerno, the connecting link between ancient and modern medicine, were barren. The labours of the faculty were chiefly sterile discussions of the ancient writers, and the elaboration of a, mostly useless, *materia medica*. The works of Paulus Aegineta were written probably about 100 years after the final burning of the Alexandrian libraries, and give evidence of the decay of knowledge since the times of Celsus and Galen. They teem with absurd and useless remedies. In the dark centuries that followed, surgery, in Europe at all events, came to be regarded as an occupation unworthy of a scholar and a gentleman. In the thirteenth, fourteenth, and fifteenth centuries the operation of trephining appears to have come again into vogue—Guy de Chauliac (1363), Paré (1561), Andreas a Cruce (1573), and many others published works

¹ Dr. Browne, *ibid.* p. 68 : “Constantinus Africanus was the first to make known to Western Europe the learning of the Arabs through the medium of the Latin tongue. He attached himself to the celebrated medical school of Salerno—the ‘Civitas Hippocratica’—and died at Monte Casino, after a life of great literary activity, about A.D. 1087.”

¶ The noble experyence of the vertuons

handy warke of surgeri/practicyd & compiled by the moost experte mayster Iherome of Buryngwarke borne in Strasborow in Almayne / y^e whiche hath it fyrst proued / and trewly founde by his awne dayly experyence. ¶ Item thereafter he hath authorysed and done it to vnderstande thugh the trewe sentences of the olde doctours and maysters very experte in the science of Surgeri / As Galienus / Hippocras / A uicenna / Gwydo / Haly abbas / Lancetrancus of mylen / Tamericus / Rogerius / Albricall / Placetrinus / Brunus / Gwilhelmus de saliceto / & by many other maysters whose names be wyrtten in this same booke. ¶ Here also shall ye fynde for to cure & hele all wounded members / and other swellynge. ¶ Item ye shall fynde on y names of herbes or of other thynges wherof reherens knowlege / y^e shall ye knowe playnly by the potecarys. ¶ Item here shall you fynde also for to make salues / plasters / powders / oyles / and drynkes for woundes. ¶ Item who so desireth of this science y^e playne knowlege let hym oftentymes rede this booke / and than he shall gette perfyte vnderstandynge of the noble surgeri.



FIG. 16.—Operations on the head in the fifteenth century.

These figures of operations are to be seen in the works of Peter Paaw and Andreas a Cruce.

with illustrations of operations crude and dreadful as compared with the Hippocratic method. Theodoric (1206–1298), a forerunner of Lord Lister, wrote against the doctrine that suppuration was necessary to the healing of a wound. “Such a practice is indeed to hinder Nature, to prolong the disease, and to prevent the conglutination and consolidation of the wound.”¹ Another of the earliest writers in mediæval times to revive scientific surgery was Henri de Mondeville (1260–1320), who wrote that, if treated on Theodoric’s and his own instructions, “every simple wound will heal without any notable quantity of pus. Many more surgeons know how to cause suppuration than how to heal a wound.”² Surgery in general, and wound treatment in particular, seem to have retrogressed for two centuries or more after Mondeville’s time. It was indeed 600 years before the sound doctrine of Theodoric and Henri de Mondeville became current practice.

THE REVIVAL OF ANATOMICAL KNOWLEDGE.

As wound surgery is the foundation of surgery, so the revival of surgery is first shown in the

¹ The first printed edition of Theodoric’s work on Surgery appeared in 1498. This sentence is quoted from *Historical Relations of Medicine and Surgery*, by Clifford Allbutt, 1905, p. 30.

² Quoted from Clifford Allbutt, *ibid.* p. 43.

treatment of wounds. The evolution of surgery as we understand it to-day presents itself to our vision in several successive and necessary stages. It commences with the renaissance of anatomy



ANDREAS VESALIUS.
Medicus et Anatomicus.

(1514-1564.)

FIG. 17.

“The Father of human anatomy.”

His principal teacher was Sylvius, and Fallopius was his pupil. His volume *De Humani Corporis Fabrica* is world famous.

and the attainment of accurate anatomical knowledge. This was later combined with the study of gross morbid anatomy. The combination of a real insight into anatomy, normal and pathological, was soon followed by the rise and rule of the famous operating surgeons.

The revival of anatomical knowledge in the sixteenth and seventeenth centuries thus laid the foundation of modern scientific surgery. The names of the great anatomist surgeons are familiar. In the sixteenth century Vesalius, Fallopius, Eustachius, Paracelsus, and Fabricius Hildanus lived and worked. In the seventeenth century and the early part of the eighteenth century there are many great names; among them I may mention Willis, Sylvius, Valsalva, Morgagni, Jean Louis Petit—and they all contributed greatly to the advance of knowledge.

The slow re-creation of surgery from the few seeds of knowledge which during many centuries had escaped the general ruin which had fallen upon all science is a fascinating and absorbing topic. The words in which Cardinal Wiseman¹ described the destruction of civilisation by the French Revolution and its subsequent resurrection seem singularly appropriate to the death and resurrection of surgery about which I have been speaking—"The French Revolution did, therefore, for perhaps the only time in the world's history, what only the complete subjugation of a country by a foreign enemy has ever done. It was a volcano, not so much in the burning and violent outburst of hidden fires, frightfully

¹ *Recollections of Four Popes*, p. 45.

energetic and appalling, as by its covering with its scoriæ and ashes the rich soil and teeming produce of civilisation. These will indeed reappear ; the surface new and unnatural will be abraded by time and storms ; and gradually the germs of old life, crushed but not killed, will struggle through, and be green again above the black field."

From the time of Hippocrates until quite recent years the technique of the operation of opening the skull underwent little if any improvement. Nor were the indications for operation better understood, for till the doctrine of localisation of the functions of the brain was accepted no progress in diagnosis was possible. Twelfth- and thirteenth-century works on surgery show, however, that some at least at this period practised the operation for injury on quite rational principles ; thus in a work by Roger Frugardi of Salerno, written about 1170, the advice given is that as many trephine holes as it seems necessary should be made on each side of the fissure, the intervening bridges of bone between them divided, and after introducing a fold of linen between the bone and the dura, the injured bone should be removed.

THE WORK OF ROGER OF SALERNO.

Dr. Charles Singer has kindly sent me two passages from this work, of which the following are translations. The writing of Roger of Salerno is important as the first post-classical work on surgery of European origin :

On Fracture of the Skull with a Large Wound.—When there is considerable and obvious fracture of the skull associated with a large open wound, such as would be inflicted by a sword or some similar weapon, any fragment of bone or other substance, the removal of which is indicated, should at once be removed (unless free hæmorrhage or other complication prevents) ; and a fold of the finest linen should then be gently insinuated with a feather between the skull and the dura mater (to clean the wound). In the opening of the fracture a piece of linen, or, what is much better, silk should be so placed that its edges are beneath the bone, in order that matter coming from the surface should not reach the dura mater and induce a graver lesion of the brain. Marine sponge carefully cleaned and dried is also employed for this purpose ; it absorbs exudations like blotting paper. The external wound should be covered with pieces of linen soaked in white of egg and lightly wrung out, over which a dressing of down should be placed and carefully bandaged ; the dressings should be changed twice daily in winter and three times in summer. The patient should lie on the affected side. This treatment should be persisted in until healing of the cranium is complete.

On the Treatment of the Skull.—If the wound is

small it should be enlarged unless bleeding or other complication prevents. The trephine should be cautiously applied close to the fissure on each side and as many perforations made as seem necessary. Then with a chisel a cut is made from one hole to another, so that the opening reaches from end to end of the fissure and exudation can escape and should be carefully cleaned away with strips of the finest linen inserted by means of a feather between the brain and the skull.

WALTER OF AGILON AND OTHERS.

Walter of Agilon, a thirteenth-century writer, emphasised that any dressing introduced between the skull and the dura, and particularly between the dura and the pia, should be clean. Dr. Singer writes : "Walter of Agilon lived about the middle of the thirteenth century, and was probably a Frenchman. He is sometimes associated with the Salerno School, but it is somewhat doubtful if he worked there. I send you a passage from the edition of his book to which I have referred." The following is a translation. After stating that a certain plaster if applied to the skull will show the presence of a fracture by becoming dry and breaking on removal, Walter goes on to say :

A fracture of the skull is known thus : there is slow fever from the first with headache, which gets a little worse each day ; there is squint, the cheeks are flushed, and if a plaster is applied it quickly dries and

breaks ; the skin is dry. If the skull is fractured in front or behind, the cure is difficult, because in front and behind the bone is in contact with the dura without any intervening space, in other parts there is a little interval, hence a lesion of the skull in front or behind is necessarily accompanied by a lesion of the dura. And it should be remarked, as is everywhere apparent, that pledgets of flax make a better dressing between the skull and the dura mater than pieces of linen, but either when placed in a wound must be clean and more particularly so when placed between the dura and the pia mater. There may be fracture without a scalp wound or a scalp wound without a fracture. If there is fracture with a scalp wound and the scalp flap hangs loose it should be removed altogether, for if much damaged it will not be sufficiently well nourished for good cicatrisation. If, however, the fracture of the skull, with dependent skin flap, has extended to the dura mater, the scalp flap should be first sutured and a crucial incision then made in it, for the skull ought to be healed first and then the skin. But if the bone wound does not extend to the dura, the bone should be removed from the scalp flap and sutures applied. Afterwards powder should be dusted on, and an opening left at the lowest point through which a tent may be inserted. If there is a scalp wound without fracture of the skull, dusting powder should be applied before suture, and then a plaster put on. If the sutured wound does not heal well, the cautery should be passed over it from one end to the other and the wound thoroughly cauterised, afterwards it should be anointed with white ointment and healed. A wound in any part of the head which reaches the brain substance is mortal.

Dr. Singer has also drawn my attention to a beautiful illuminated surgical manuscript (MS. Sloane). It is a French work of the thirteenth century. The text is by Roger of Salerno, and the operation of trephining is illustrated. In another manuscript (Bodleian) there are eight miniatures, all of them very clear, illustrating operations on the skull. This is also of the thirteenth or the early fourteenth century. Another manuscript (Trinity College, Cambridge) contains six miniatures illustrating operations on the skull, and is of the thirteenth century.

When anatomical study was revived, attempts were made to explain the symptoms observed during life by the nature, position, and extent of the lesions found after death. The earlier writers of this period grouped their observations on intracranial disease under such headings as "de dolore capitis," "de apoplexia," "de epilepsia," "de phrenitica," following the old classification of disease by symptoms, and seeking an explanation of each particular symptom. In this way certain symptoms and groups of symptoms came to be associated with certain intracranial lesions ; but much confusion prevailed, until physiological experiment furnished the true interpretation of many of the symptoms. Massa ¹

¹ *Liber Introductorius Anatomicae*, Venice, 1536, p. 57.

(died 1569) describes a case of brain abscess that occurred in 1533. Contra-lateral paralysis is recorded, and the remark made is that such paralysis does occur in certain injuries of the head. In a folio published in 1573 by Andreas del Cruce the instruments used in trephining are elaborately illustrated; some are quite practicable, others weird-looking. It is noteworthy that in one illustration the patient is represented in the prone position, and the trephine is applied in the occipital region.

THE SIXTEENTH AND SEVENTEENTH CENTURIES.

Fabricius Hildanus¹ (1560–1634) relates cases of brain abscess and fractures of the skull, and clearly recommends trephining for retained pus or blood even in the absence of a fracture of the skull. A fatal aural case, seen in 1599, is described very fully.

In Pepys' Diary, February 3, 1677, this entry appears :

To White Hall, and there to Sir William Coventry's chamber, and there staid till he was ready, talking, and among other things of the Prince's being trepanned, which was in doing just as we passed through the Stone Gallery. . . . With others into the House,

¹ *Observationum et curationum chirurgicarum centuariae, 1606–1641.*

and hear that the work is done to the Prince in a few minutes without any pain at all to him, he not knowing when it was done. It was performed by Moulins. Having cut the outward table, as they call it, they find the inner all corrupted, so as it come out without any force ; and their fear is, that the whole inside of the head is corrupted like that.

Prince Rupert recovered, so the whole inside of his head was not corrupted !¹

Bonetus ² (1620–1689) describes cases of meningitis, extra-dural abscess, and brain abscess, but does not seem to have adopted serious surgical measures for their relief.

EIGHTEENTH CENTURY.

Valsalva ³ (1666–1723) drew attention to the cardinal fact in cerebral localisation that motor paralysis from a cerebral lesion is on the contralateral side. He noted this fact in apoplexy as well as in cases of cranial injury. He seems to

¹ *Memoirs of Prince Rupert*, by E. Warburton, 1849, vol. iii. p. 245. Prince Rupert was shot in the head at Armentières in July 1649 and later taken through La Bassée to Béthune for treatment. A French general expressed polite regret : “ Monsieur, je suis bien fâché que vous êtes blessé.” Rupert replied, “ Et moi aussi ” (p. 486). October 1668—The wound in the head received in Flanders had given much trouble. After a trifling accident it broke down again and caused great tortures. Trepanning was performed, when a particle of the skull was found to have been driven into the brain. Relief followed the operation and he stayed at Tunbridge Wells during convalescence. He died of fever and pleurisy, æt. 63, on Nov. 29, 1682.

² *Sepulcretum*. Lyons, 1700.

³ *De Dura Humana Tractatus*.

have had some difficulty in getting his views on this subject accepted. He says : “ I solemnly affirm that it was ascertained by many years’ work and confirmed by many post - mortem examinations.” *Nec silet mors* was the motto of the Pathological Society of London ; and Valsalva might have written what a well-known novelist wrote : “ For him who knows how to read therein, the dead body is a book in which he learns how to save human lives.” ¹

Morgagni ² (1682–1771). Valsalva held the view that abscess of the brain was a primary disease, but Morgagni made the great discovery that aural suppuration from abscess of the brain is an erroneous doctrine. “ On the contrary, abscess of the brain results from suppression of discharge of the ear.” He relates cases in which carious erosion had opened up a passage between the ear and the cranial cavity.

A work by Jacobus Berengarius,³ published in 1728, contains numerous quotations from Galen, Avicenna, and others, and many fanciful remedies—for example, as an adjunct to convalescence is the recommendation that a large number of freshly baked loaves should be placed in the patient’s room because this warms the air,

¹ Eugène Sue, *Les Mystères de Paris*.

² *De Sedibus et Causis Morborum*.

³ *Jacobi Berengarii De Fractura Cranii*, Editio Nova, 1728.

and is wonderfully comforting, as may be known from the story of Democritus, who lived for several days solely on the smell of bread ! A



FIG. 18.—Joannes Baptista Morgagnus (1682–1771).

“ Vir ingenii, memoriae, studii incomparabilis.”—HALLER.

The author of *Seats and Causes of Disease*, which gained for him the title of “ Father of Pathology.” He collaborated with Valsalva in the study of human anatomy.

description of the operation of trephining is given ; among the instruments figured are burrs, a trephine with outside teeth, and a gouge with

a straight edge. The following sound advice is given : “ Let the reader note well that when for any reason it is decided to open the skull . . . the sooner it is done the better, serious symptoms should not be awaited, nor days of election as the seventh or fourteenth ” (p. 279).

PERCIVALL POTT.

Percivall Pott¹ (1713–1788) was elected on the staff of St. Bartholomew’s Hospital in 1744. His clinical records of cases are not Hippocratic. In head injuries the treatment was always “ phlebotomy and an open belly.” Trephining is fully described and often performed. The trephine, used by Pott, is identical with, but probably larger than that used by the Greek surgeons. He quotes Celsus and other authors frequently. Contra-lateral paralysis is noted casually in certain cases. He says the symptoms arising in head injury are not due to fractured skull, but to injury of the brain. He made careful post-mortem examinations, and, like Petit, considered a fracture, even without depression, an indication for operation (vol. i. p. 135). In suppuration beneath the bone he advocates free removal of bone.

¹ *Chirurg. Works*, vol. i., 1790, by J. Earle.

The only chance of relief is, from laying bare a large portion of it, that the discharge may be as free, and the confinement as little as possible ; nothing but this can do good ; the space of time in which it may



FIG. 19.—Percivall Pott.

Surgeon to St. Bartholomew's Hospital during 42 years.

prove beneficial is very short, that once elapsed is absolutely irrecoverable ; and the necessary operation for obtaining such end may full as well be totally neglected, as done by halves or too late (vol. i. p. 166).

He points out that there is no special danger in trephining over the temporal bone or over

the superior longitudinal sinus, and relates one successful case in which the sinus was wounded by a fragment of the fractured bone (Case 27, p. 194), and one (fatal) in which the sinus was exposed on removal of the broken bone, and he deliberately bled from it (Case 28, p. 196). Incision of the dura is mentioned (on p. 247). "An artificial opening, therefore, must be made by the division of the dura mater, and perhaps of the pia also."

JEAN LOUIS PETIT.

Jean Louis Petit¹ (1674-1750), a great French surgeon, opens his account of the operation of trephining with the reassuring statement that it is not of itself mortal. He advised it in all cases of scalp wound with fracture, "the fracture itself indicates the trephine, not only to elevate any bone that may be depressed and remove splinters, but to give exit to blood effused between the dura and the bone." He admits that recovery sometimes occurs without operation, but says that it is better to risk operating unnecessarily in a few cases than to expose many cases of fractured skull to the risk of almost certain death. He relates a case of abscess of brain following fracture

¹ J. L. Petit, *Traité des maladies chirurgicales*, 1790 edition, pp. 74, 123.

that recovered—he had trephined and incised the dura mater, and the abscess subsequently burst ; the brain had not been incised. This must be



FIG. 20.—Jean Louis Petit.

M^e en Chirurgie à Paris, de l'Académie Roy^{le} des Sciences, et de la Société Roy^{le} de Londres ; Censeur et Démonstrateur Royal, Ancien Prévost de St-Cosme ; Ancien Directeur et Secrét^{re} de l'Académie Royale de Chirurgie.

the case referred to by Dupuytren in a passage quoted farther on in this lecture. The indications for trephining other than for fracture which Petit discusses are unconsciousness, hæmorrhage

from the nose, mouth and ears, paralysis, and convulsions. The article is of considerable interest and many cases are related in it; the main argument is that if an intracranial effusion

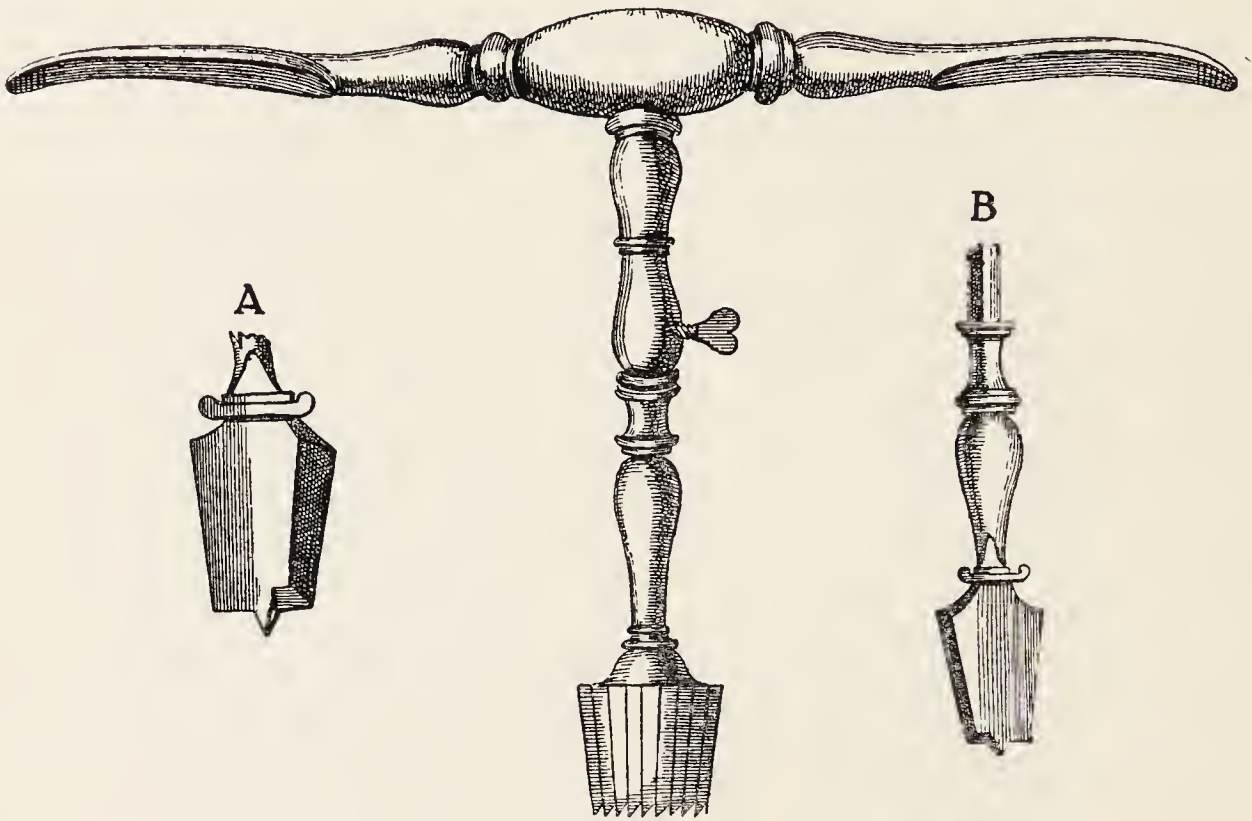


FIG. 21.—Drawing of a trephine and of the trépan exfoliatif. (Jean Louis Petit.)

A and B, different sizes of the trépan exfoliatif. The trépan exfoliatif would not remove a disc of bone but would bore a hole like a carpenter's bit. It is noteworthy that the trephine is conical in shape and has outside teeth like that which came into use about 1890 and was then advertised as a new invention. This type of trephine was probably in use long before Petit's time.

can be diagnosed operation should be done, trephining should not be done to cure convulsions, but to remove the particular cause of the convulsions. Petit used a trephine which was cone-shaped, and had outside teeth, and an instrument he called "trépan exfoliatif."

JOHN HUNTER (1728–1793).

Sir William Lawrence (1783–1867) said that John Hunter was the greatest man in the combined character of physiologist and surgeon that the whole annals of medicine can furnish.¹

His originality is equally conspicuous in surgery



FIG. 22.—John Hunter. (After Sir Joshua Reynolds.)

The rediscoverer of the method of experiment.

which he entirely revolutionised. It was the boast of Augustus that he found Rome built of brick and left it built of marble. Hunter found surgery a mere mechanic art. . . . He left it a beautiful science. . . . Surgery, did I say, every part of medical science has felt the vivifying influence of the physiological principles emanating from the bold and inventive genius of Hunter.²

¹ Preface to the works of John Hunter. Edited by James F. Palmer, 1835.

² Sir William Lawrence's Hunterian Oration, 1846.

While Hunter's chief contemporaries were in the main only operating surgeons, he was a philosopher, scientist, and experimentalist. He wrote of the principles of surgery, and the cases and operations he quotes are used as illustrations of facts observed or of principles which are fundamental in the science and art of surgery. It is therefore not surprising that his remarks on concussion, compression, and laceration of the brain and on fracture of the skull are models of accurate observation. He writes :

Fractures of the skull of themselves produce no symptoms respecting the brain, only those of broken bone. We do not trepan for concussion alone. In young people a depression fracture may give rise to no symptom at the time, but as the patient grows up bad symptoms may arise. In all cases of depression the trepan is necessary. We must not divide the dura unless we are certain that there is a fluid effused under it. Fissure fractures run sometimes through the base of the skull. I have trephined once below the insertion of the muscles of the neck and with success. A gentleman for two years after receiving a blow on the skull was delirious. I felt a little depression and applied the trepan and took out a piece of bone which had been depressed all the time, part of the internal table was absorbed and pus was lying on the dura mater.¹

¹ *Collected Works of Hunter*, edited by J. F. Palmer, 1835, vol. i. p. 486 *et seq.* Articles on injuries of the head and fracture of the skull.

Hunter's editor in a note (p. 491) refers to a somewhat similar case related by Sir Astley Cooper in which there was total loss of volition and voluntary motion continued for thirteen months. Cline operated and removed the depressed bone. "In four days the young man was restored to the perfect possession of his intellect."

NINETEENTH CENTURY: ASTLEY COOPER
(1768-1841).

Astley Cooper,¹ a pupil of John Hunter, discouraged operation as a preventive measure except in compound fracture of the skull.

In simple fracture when it is attended with symptoms of injury to the brain deplete before you trephine, and when it is unattended with such symptoms though there may be depression deplete merely and never divide the scalp. If the fracture be compound the treatment must be very different because a compound fracture is followed very generally by inflammation of the brain and it will be of no use to trephine when inflammation has once formed. It might be thought that it would be time enough to perform this operation when inflammation had appeared, but this is not the case, for if inflammation comes on the patient will die whether you trephine or not.

¹ *Lectures on the Principles and Practice of Surgery*, sixth edition, 1839, p. 143.

He relates a case (p. 144) of cure of Jacksonian epilepsy caused by a spicule of bone. This was removed by operation and the patient was cured.

LARREY (1766-1842) AND GUTHRIE
(1785-1856).

Baron Larrey and Guthrie were the great surgeons of the Napoleonic wars. They were the last of the great army surgeons before the Listerian era, and both had extensive experience of war injuries of the head.

Baron Larrey¹ (1766-1842) was a prominent surgeon before Napoleon rose to power. In 1788, before the war with England, he visited Newfoundland as surgeon to a French man-of-war. In order to reach his ship he walked from Paris to Brest. When at Newfoundland he made his first acquaintance with the English, of whom he wrote :

We were astonished at the beauty of the English women whom we met in the course of our walk ; almost all were of good stature, well developed and with good figures, pretty hair, pleasant faces, bright eyes, and surprisingly white teeth. In some, chestnut hair and eyelashes contrasted agreeably with large blue eyes.

On visiting an English man - of - war and

¹ *Clinique chirurgicale*, vol. i., 1829.

witnessing a display of drill and gunnery, given in honour of the visitors, he wrote :

All these manœuvres were remarkable for their precision and rapidity. I derived great pleasure from visiting this ship, where the most perfect order and



FIG. 23.—Dominique-Jean Larrey.

Surgeon to the French armies during the campaigns of Napoleon.

the most scrupulous cleanliness prevailed. We sat down to table at noon with the officers, and midnight found us still united !

Larrey considered trepanning indispensable in depressed fracture, and also to remove foreign bodies which remained near the wound in the skull, or the position of which could be determined by a probe or gum elastic catheter, even if a considerable distance from the aperture in the

bone, and relates several cases in which this was done (pp. 210-215). He did not advise operation when the foreign body could not be located. He treated hernia cerebri with compresses, and did not advise a decompressive operation.

Larrey observed the effects of injury to various regions of the brain, and noted several facts of importance in cerebral localisation—*e.g.* contra-lateral palsy, loss of memory, aphasia; also that when paresis is caused by a cerebellar lesion it is on the homo-lateral side (p. 300); he also noted the sudden and dangerous attacks of syncope (respiratory failure) in cerebellar lesions; an account of a fatal case of otitic cerebellar abscess, and the findings at the post-mortem examination is given on pp. 315-316. Jacksonian epilepsy came under his notice; he relates one case of cure by operation, and a case of caries with abscess in which the attacks could be produced at will by pressure with the finger (p. 478). He accompanied Napoleon in his campaigns, and was so popular among the soldiers that on being recognised in the struggling mass of men on the bridge over the Beresina he was handed on from soldier to soldier till he reached the other side.

Guthrie¹ is the historian of the surgery of

¹ *Injuries of the Head affecting the Brain*, 1847.

the Peninsular War. He records a very large number of cases he observed during and after the battles in Spain, and many also after the battle of Waterloo.



FIG. 24.—George James Guthrie.

Deputy Inspector of Hospitals during the Peninsular War.

The Duke of Wellington said of Guthrie “that he considered his conduct as deserving the imitation of the whole Army.”

John Bell (1762-1820) observed (*Principles of Surgery*) that

the situation of a military surgeon is more important than that of any other. While yet a young man he has the safety of thousands committed to him in the most perilous situations, in unhealthy situations, and in the midst of danger. He is to act alone and unassisted, in cases where decision and perfect knowledge are required ; in wounds of the most desperate nature, more various than can be imagined, and to which all parts of the body are equally exposed ; his duties, difficult at all times, are often to be performed amidst the hurry, confusion, cries, and horrors of battle. Even in the seasons of greatest difficulty, cold and heat, hunger and fatigue, vexation of mind, and all the distresses of foreign service aggravate disease ; and, while they render his exertions of so much importance, teach him imperiously the necessity of an accurate and ready knowledge of his profession. It is to him that his fellow-soldiers look up at the moment of distress : his charities and his friendship are prized beyond all price ! What part of education is there, needful or even ornamental, for the surgeon living at his ease in some luxurious city, which the military surgeon does not require ? What qualifications, of the head or of the heart ? He has no one to consult with in the moment in which the lives of numbers are determined ! He has no support but the remembrance of faithful studies, and his inward consciousness of knowledge ; nor anything to encourage him in the many humble yet becoming duties which he has to fulfil, except his own honest principles and good feeling.

This fine passage is quoted by Pettigrew (*Medical Portrait Gallery*, 1839) as illustrative of Guthrie's life and character.

Guthrie was never wounded, but he had many narrow escapes. He says :

During the second attack made by the French at the battle of Talavera, I found myself under the fire of a battery of 12 guns, and just at the distance at which the shot began to ricochet or bound like cricket balls. The position was not desirable, and I tried to change it as quickly as possible by carefully guiding my horse between the shot.

He writes :

Injuries of the head affecting the brain are difficult of distinction, doubtful in their character, treacherous in their course, and for the most part fatal in their results. One man may lose a portion of his brain without its being productive at the moment or even after his restoration to health of the slightest apparent functional inconvenience ; whilst another will fall and shortly die without an effort at recovery. The result of my experience is, that a fracture of the skull, with even the lodgment of a foreign body and a portion of the bone in the brain, may sometimes be borne without any inconvenience in the *back* part. An injury of apparently equal extent is more dangerous on the forehead than on the back part. The part of the brain injured can sometimes be distinguished from the symptoms which take place. The rule in surgery is absolute to trepan in extra-dural hæmorrhage. Local pain and epilepsy may follow fracture and displacement of the inner table and require operation. Free

incisions must be made in the scalp when it is inflamed. When operation is necessary in fractured skull it should be done at once—delay is fatal.

Guthrie here quotes the case of an officer under the care of Larrey ; Larrey saw the autopsy ; one frontal lobe was suppurating. Larrey remarks : “ I had in this case to regret that I did not apply the trephine.” “ *Occasio praeceps, judicium difficile.*” Guthrie also quotes from J. L. Petit in support of the view that operation is necessary. Petit, after relating the history of two cases of injury of the head, in each of which a depressed portion of bone was not elevated, and a portion of the inner table was separated and found adherent to the dura mater ten years afterwards, says : “ Two or three of such wounds out of a thousand will get well without operation, but the remainder will die without it.” Guthrie writes :

All foreign bodies should be removed from under the dura ; the wound in the dura should if necessary be enlarged. When matter is circumscribed under the dura there is some hope. The records of surgery supply many cases in which incision of the dura to give exit to pus or blood has been done or might have been done with advantage ; incision of the dura is more commonly done in France than in England. Tense elevation of the dura and the absence of pulsation indicates incision.

Several striking cases of the advantage of incision of the dura are related.

In cases of hernia cerebri Guthrie advises gentle pressure and is averse from all operations. He was a strong opponent of the mediæval practice of repeated trephining which had apparently survived to his time, and he quotes the following case in support of his views :

Philip of Nassau, having been thrown from his horse, fractured his skull by striking his head against the stump of a tree. He was trepanned twenty-seven times by a surgeon of Neomagen. He gave a certificate of this signed by himself ; and as a proof of his complete recovery drank three of his companions to death.¹

THE ZENITH OF PRE-LISTERIAN SURGERY.

During the first seventy years of the nineteenth century the art of the pre - Listerian surgeon reached its zenith ; though we cannot but be

¹ Quoted from Solingen, *Manuale Operationen der Chirurgie*, Amsterdam, 1684, cap. vii. p. 29. Solingen says that Philip of Nassau, Lord of Grimhuyse, was the son of Justinus de Nassau and grandson of William I. of Orange. The surgeon who operated on him was Mr. Hendrick Chadborn. The certificate, dated August 1664, was given to Solingen by Amos Chadborn, a schoolmaster, and brother of the surgeon. The injury suffered by Philip was a comminuted fracture of the skull. Guthrie refers to several other cases of repeated trephinings, e.g. Saviard (*Nouveau recueil d'observations chirurgicales*, p. 139, Paris, 1702) trepanned one person twenty times. Russ Martel and Le Gendre (see Loyseau, *Observationes méd.-chirurg.*), surgeons to the King of Navarre, say that in the year 1686 they took away nearly both parietal bones and the patient recovered and lived for thirty years afterwards.

struck with the great prevalence of sepsis. The surgery of the brain seems to have been limited to the surgery of fracture of the cranium. However great the change from Celsus to Fergusson may have been, the change from Fergusson to the present day is incomparably greater. In a very interesting paper entitled "The Use of the Trephine in Depressed Fracture of the Skull," Robert Hudson, of Redruth, writes (1877) :

There is no subject in surgical literature which seems to have created more divergence of opinion than the employment of the trephine in depressed fracture of the cranium. In his celebrated essay Percivall Pott betrays neither doubt nor hesitation ; firm belief in the efficacy of the trephine is evidenced in almost every page. How then can we explain the revolution involved in the statement that in St. Bartholomew's Hospital, to which Pott's genius added lustre and renown, his views have been discarded, and for six years previous to 1867 the trephine had not been once used in an injury to the head ? Around Redruth and Camborne Pott's principles still prevail, taught by Pott himself to the great-grandfathers of the present generation of surgeons.

Talleyrand, it is said, observed that the philosophy of a previous generation might be gathered from the common people of the existing one, and it is so in this case.

On the occurrence of a head injury the first question asked by the comrades of a wounded miner almost invariably was, Is the skull broken ? And if

a reply were given in the affirmative, the next, "When are you going to bore 'un?" Many of the accidents were due to blasting. It was before the invention of the safety-fuse. Forty years ago trephining was more frequent than at the present time. One surgeon, now living, tells me that during his pupilage a week rarely passed without one or two trephining operations. A very large percentage of the "bored" skulls recovered. Too much stress cannot be laid on the importance of early operation and the purity of our atmosphere which is daily swept by the Atlantic breezes. We have no reason to fear sepsis; pyæmic risks are unknown.¹ "The elevation of a depressed bone in compound fracture of the cranium need not be looked upon as a serious and in itself a dangerous operation."²

Hudson gives figures which show that trephining had fallen into disrepute in London, and was attended by a great mortality:

Guy's Hospital, 1861-1868, 51 operations, 39 deaths.

„ „ 1871-1876, 16 operations, 12 deaths.

St. Thomas's Hospital, 1866-1870, 3 operations, all fatal.

St. George's Hospital, 1870-1877, 16 operations, 13 deaths.

As illustrating the septic atmosphere of the London hospitals at this time Hudson states that in 1868, in St. George's Hospital, there were 22 cases of pyæmia, and in 1869 14 such cases, all commencing in the hospital and all ending fatally. At the end of Hudson's paper is a

¹ *Brit. Med. Jour.*, July 21, 1877.

² Le Gros Clark's *Lectures on Surgical Diagnosis*, 1870, p. 89.

reference to two cases treated by Mr. Davies Colley (*Guy's Hospital Reports*, 1877), in which the trephine was successfully employed. Mr. Davies Colley writes :

These two cases support the rule which *most of our text-books omit or fail to impress* that in punctured fractures of the skull it is the surgeon's duty to *trephine at once* without waiting for symptoms of compression or irritation.

Before Listerian days little or no effort towards cleanliness was made in the theatres of the London hospitals. Indeed, I remember that in some cases the more filthy the surroundings—*e.g.* the surgeon's coat—the better pleased the surgeon appeared to be ! Further, a post-mortem examination was not seldom attended, and perhaps fingered immediately before the performance of an operation ; and as the surgeon would naturally attend an autopsy on a surgical case it would be not unlikely that the cause of death would be erysipelas or some other form of sepsis. Hudson's experience is akin to that of Baron Larrey ; Larrey fully appreciated the dangers of sepsis in hospitals as they then were, and whenever he could he sent his patients right away at first, however bad they were, the same day or the day after severe operations ; for he found that in spite of rough transport they did better,

whether in the heat of Egypt or the rigours of a Polish winter when out on the road, than when shut up in churches or hospitals.

HUGHLINGS JACKSON.

I was elected on the surgical staff of the National Hospital, Queen Square, thirty years ago, but I had been before this on some occasions on surgical duty there during the absence of Victor Horsley. At the National Hospital I was at once conscious of contact with two very remarkable men : Hughlings Jackson and David Ferrier. I do not include Horsley, because I had been in almost daily association with him, at the Brown Institution, for some years.

Of Hughlings Jackson I need only say that he remains in my vision as the Socrates and Lycidas of neurology. He contributed four papers¹ on "Defects of Sight in Diseases of the Nervous System," one in 1863, two in 1865, and one in 1866. These papers are of extraordinary interest in the slow unravelling of the truth, with regard to the nature and cause of the optic neuritis of intracranial origin. He urged that routine ophthalmoscopic examination should be made in all cases of severe cerebral

¹ Vol. iv. and vol. v., *Royal London Ophthalmic Hospital Reports*.

disease, whether the patient complained of defect of sight or not. Attention is directed to the headache and vomiting which occur in cases of intracranial tumour, and the danger of mistaking such symptoms for those of gastric disease. The importance is also insisted upon of ophthalmoscopic examination in cases of hemiplegia, in Bright's disease, and in cases brought in comatose. I have always thought that, independent of Jackson's mental eminence, his work at Moorfields Eye Hospital in early life was of supreme importance to the future progress of neurology. In 1865 Jackson wrote :

It is a great mistake to suppose that the form of amaurosis (there may be no amaurosis with or even after optic neuritis) necessarily indicates disease primarily involving the optic nervous system.

Again, he described the association of headache, vomiting, and optic neuritis in cases of cerebral tumour, and laid great stress on the fact that

the chief disease in a cerebral case in which amaurosis is a symptom, rarely involves the optic nervous system. It is just as important to determine whether a patient's blindness depends on choroiditis, apoplexy of retina, or neuritis as whether his bad talking depends on incoherence, defect of the faculty of language, or paralysis of the tongue.

In 1865 Jackson wrote :

When I was first studying the point, it occurred to me there might be particular parts of the hemisphere, disease of which produced amaurosis ; just as disease of a particular part of the left hemisphere produces aphasia. I have found disease of the right hemisphere



FIG. 25.—John Hughlings Jackson (1835–1911).

“ The Socrates of Neurology.”

many times with amaurosis. I was at one time *sliding* into the belief that disease of the right hemisphere was very important from the point of view of optic neuritis. In Case XII. I received a check, which prevented me *sliding* into the conclusion that disease of only the right hemisphere produced amaurosis, as disease of the left only seems to produce loss or defect of speech.¹

¹ *Moorfields Hospital Reports*, vol. v. p. 59.

In another place the sentence occurs :

I suggest that unilateral convulsions point to disease of the opposite part of the brain, as unilateral paralysis nearly always does.

It is needless to continue making extracts from these classical papers ; every paragraph teems with Hippocratic insight and wisdom.

We do not now speak of “ amaurosis ” as a symptom of cerebral tumour, but of optic neuritis or optic atrophy ; the use of the ophthalmoscope has explained how blindness results from cerebral tumour, and this disastrous consequence can now in many cases be averted by a decompressive operation. Jackson published two pioneer lectures¹ in 1873 on the “ Diagnosis of Tumours of the Brain.” Jackson’s classical papers on “ Epilepsy,” on the “ Affections of Speech,” and on many other subjects I have no time to mention.

ADVANCES IN OPHTHALMOLOGY.

In 1847 Babbage, an English mathematician, demonstrated to Wharton Jones that the interior of the eye could be seen by means of a small plane mirror, from the centre of which a small portion of the silvering had been removed. This was the primitive ophthalmoscope, but the

¹ *Medical Times and Gazette*, 1873.

seed fell by the wayside, and it was left to Helmholtz to introduce into practice two years later (1849) the instrument which has proved of such great importance. Helmholtz was a military surgeon, and later a professor of anatomy, and never practised as an ophthalmic surgeon ; in his book ¹ published in 1850 he wrote :

I believe that all the alterations of the vitreous body and of the retina which, until now, have been found only in cadavers, will also be recognised in the living eye—a possibility which appears to promise the most remarkable advances for the hitherto undeveloped pathology of this structure.

The importance of optic neuritis and its association with cerebral lesions, now a matter of common knowledge, was soon recognised as the use of the ophthalmoscope became general. In 1860 von Graefe published a paper ² on the association of optic neuritis with cerebral tumour, in which he pointed out that total blindness, when occurring in these cases, was not, like the palsy, a direct effect of the lesion, but the secondary result of optic neuritis :

When with cerebral lesion which has caused various palsies, total blindness also results, this was formerly quite naturally attributed to paralysis of the optic nerves. If from such cases conclusions are drawn

¹ *Beschreibung eines Augenspiegels.*

² *Archiv für Ophthalmologie*, vol. vii. part 2, p. 58.

respecting the crossing of the optic nerves, physiological errors result.

DAVID FERRIER.

The other physician whose name I mentioned was Ferrier, who belongs to that small group of great men who re-discovered and re-created the science of experimental neurology, lost to mankind since the times of Galen. Ferrier was experimenting before Charles Beevor, Victor Horsley, or myself were students of medicine. He says in his paper¹ published in 1873 that the resources of the pathological laboratory of the West Riding Lunatic Asylum were unreservedly placed at his disposal for experimental purposes. In this paper numerous experiments are related bearing on the subject of localisation of the functions of the brain. It is of interest to note in relation to the recognition of the so-called syndrome symptoms of brain tumour that Ferrier published two papers² in 1879 : (*a*) "On Pain in the Head in Connexion with Cerebral Disease," and (*b*) "On Vomiting in Connexion with Cerebral Disease."

In the volume (second edition) on the Functions of the Brain, published by Ferrier in 1886,

¹ *West Riding Lunatic Asylum Reports*, 1873.

² *Brain*, vols. i. and ii.

a most interesting account (among others) is given of the experiments leading to the discovery of the visual centre and the understanding of the symptom hemianopia.¹

Every discovery is a verified hypothesis ; and there is no discovery until verification has been gained ; up



FIG. 26.—David Ferrier.

His gift to science—"Cerebral Localisation."

to this point it was a guess, which might have been erroneous.²

Hence the incalculable value of the method of experiment, and of the labours of Ferrier and others who have given their time and strength to experimental investigations.

¹ Von Graefe, *Archiv für Ophth.*, 1856, vol. ii. part 2, p. 286, describes hemianopia and its association with cerebral disease.

² G. H. Lewes, *The Physical Basis of Mind*.

EARLY WORK ON CEREBRAL LOCALISATION.

The date of the first precise proof of cerebral localisation is said to be 1861, when Broca showed at the Anthropological Society of Paris the brain of a man who for twenty-one years had lost the faculty of speaking. There was softening of the third left frontal convolution. But in 1829 Cruveilhier¹ had a patient under his care, a woman aged 45, in whom the symptoms noted were frontal headache, weakness of the left leg, slow speech, mental enfeeblement, and involuntary micturition. He saw the case on September 3, 1829. Death took place on October 3. Cruveilhier had diagnosed a tumour of the right frontal lobe, and had the satisfaction of demonstrating to his class the tumour in the situation in which he had predicted that it would be found. It appears to have been an endothelioma of meninges. It had formed a cup-shaped depression in the right frontal lobe.

Cruveilhier knew, as Hippocrates did, that a lesion of one side of the brain was not seldom associated with paralysis of the opposite side of the body. There are other cases in literature. The following case, for example, was published

¹ Cruveilhier, *Anatomie pathologique du corps humain*, 1830. A beautiful illustration of this tumour is in Cruveilhier's atlas.

in 1831.¹ The condition for which operation was carried out was Jacksonian epilepsy.

A girl, aged 11 years, was struck on the head with a garden rake by a playfellow. The wound healed readily. Some months later while at school she



FIG. 27.—Tumour of meninges in right frontal region. (Cruveilhier, 1830.)

The symptoms recorded are frontal headache, inability to walk, weakness of left leg, slow speech, mental enfeeblement, and involuntary micturition.

A similar tumour (endothelioma) causing a depression in the left frontal lobe is in the R.C.S. Museum.

became unconscious with convulsive movements, then stertorous breathing occurred, and in half an hour she was awake and well again. These attacks recurred at irregular intervals, and it was noticed that tremor of the right hand occurred at the commencement of

¹ Heyman, *Magasin für die gesammte Heilkunde*, vol. xxxi. p. 212. If such a case had occurred in the "eighties" it would have been published as miraculous.

the attack. Heyman found a scar over the left parietal bone. A trephine $1\frac{1}{4}$ inches in diameter was applied. The dura beneath was discoloured. It was incised, and a tumour yellow in colour was seen embedded in the brain. It was removed and the section showed caseous matter. Recovery was uninterrupted, the tremor of the hand ceased, no further Jacksonian attack occurred, and twenty-four years after the operation the patient was in perfect health.

Another case was reported in 1665 by Peter de Marchettis.¹ He writes :

I remember having a consultation with the famous D. Julio Sala, professor at Pavia, about a man who had been wounded in the head with a dagger. Not only was the bone injured, but the membranes and even the brain. The external wound had been treated by certain practitioners and a cicatrix had formed. After two or three months the patient was troubled with epilepsy and had a fit twice or three times a month. When asked by Professor Sala whether he had ever had an injury to the head, he replied that he had, and pointed out the place. I immediately inserted a probe beneath the crust, and found a penetrating wound, and proceeded at once to operation, and the opening of the parts. The next day I applied the trephine ; yellow pus escaped. For 20 days I applied over the brain black western balsam, with the use of which the wound granulated, and in 30 days the patient was cured of his wound and of his epilepsy.

¹ *Obs. Medico-Chirurgicarum*, Obs. vii. p. 11.

This case was obviously one of meningo-cortical abscess cured by operation.

Fritsch¹ and Hitzig in 1870 marked out certain centres in the brain by means of electrical stimulation ; but Ferrier soon left this work far behind by precisely charting certain centres for movement and for special sense. I was present at the meeting of the Physiological Section of the International Congress of Medicine in 1881.² Ferrier's work was brought prominently into notice at this meeting. There was a Homeric contest of transcendent moment to the advancement of knowledge, and vital to the interests of mankind, over the dog shown by Goltz and the two monkeys exhibited by Ferrier. Experimental injuries had been inflicted upon the cerebral cortex of each of these animals. The condition of the dog was supposed to prove that localisation of function in the cortex cerebri did not exist. One of the monkeys had characteristic cerebral hemiplegia ; as it came into the room, Charcot remarked, " It is a patient." The other monkey showed no signs of hearing when a percussion cap was snapped in its immediate vicinity ; indeed, it was the only mammal in

¹ Du Bois Reymond's *Archiv*, 1870.

² Pp. 230-237, *Transactions of the Congress*, vol. i. Goltz spoke of the " utter folly of the view that special parts of the brain are peculiarly associated with certain functional departments,"

the room that did not jump as the detonation occurred. Three years before this demonstration I listened to a lecture in which we were told that the brain functioned as a whole, whatever that may mean ; but now all doubt as to the truth of the great doctrine of cerebral localisation was laid to rest, and the ground was prepared for the immense progress of the coming years.

WILLIAM MACEWEN AND VICTOR HORSLEY

Following on Ferrier's demonstration of the truth of cerebral localisation, a tremendous activity in work designed to elucidate the anatomy and physiology of the nervous system was carried out, the like of which has not been seen before or since. (It should be remembered that at this time the science of bacteriology was only just born, and that chemical pathology was unknown. In 1884 I joined the first class in bacteriology formed in the ancient University of Leipzig. The bacillus of tetanus was discovered in 1884, but a pure culture was not obtained till 1889. A toxin was demonstrated in 1886.) From 1884 to 1891 Horsley produced eight papers of transcendent importance in association with Schafer, Beevor, Semon, W. Spencer, and Gotch. Besides the experimental stimulation of the cortex

and internal capsule, the degeneration of fibres caused by ablation experiments and by disease were a fruitful source of knowledge, for new methods of staining nerve cells and nerve fibres were discovered, and thus both the normal and the pathological anatomy of the brain were clearly demonstrated. A good example of the value of modern microscopic methods was the paper by R. H. Clarke and Horsley on the "Intrinsic Fibres of the Cerebellum, its Nuclei and Efferent Tracts."¹ The Marchi method of staining was employed.

Surgeons and physicians who practise neurology are divided into two classes: (*a*) those who have themselves become acquainted with the physiology of the brain by the method of experiment either by performing experiments themselves or by watching, as Hughlings Jackson did, experiments being performed by others; and (*b*) those who depend on the records of the experimental work of others, they themselves having no personal knowledge of such experiments. Horsley is the supreme representative of the former class, having with his associates in a few years gathered a vast field of knowledge of the physiology of the brain. At the annual meeting of the British Medical Association² at

¹ *Brain*, 1905.

² *Brit. Med. Jour.*, 1886, ii. p. 670.

Brighton in 1886 Horsley read a paper on brain surgery, especially noteworthy because the diagnosis of each case reported was discussed with reference to his experimental work already done on the monkey's brain. In 1887 Horsley¹ published a paper giving details of 10 cases of cerebral surgery. He again pointed out that such work could not be carried out without a knowledge of the physiology of the brain, which could only be obtained by experiment.

In 1888 Macewen² gave a splendid address on the surgery of the brain and spinal cord at the annual meeting of the B.M.A. in Glasgow. He stated that he had operated on 21 cases of cerebral disease with 18 recoveries. Of the three cases that died all were *in extremis* when operated on. The first case, one of abscess in Broca's convolution, was diagnosed in 1876, but no operation was allowed. The second case occurred in 1879 : a subdural collection of blood was evacuated under a fissured fracture. Macewen wrote :

The full force and significance of the experiments of Fritsch and Hitzig in 1870 were not recognised, in this country at any rate, until Ferrier's observations on the brains of animals undertaken to put to an experimental proof the views entertained by Hughlings Jackson were published in 1873. Another link in

¹ *Brit. Med. Jour.*, 1887, i. p. 863.

² *Ibid.*, 1888, ii. p. 302.

the unity of the plan of creation was manifest, as even in the higher and more complex brain of man parts existed whose functions found homologous expression in that of the lower animals.

In 1888 Keen¹ published three cases of cerebral surgery. The first case occurred in 1887; a large meningeal tumour was removed from the fronto-parietal region; in the second case a scar in the cerebral cortex was removed; and in the third the part of the cerebral cortex in which are represented the movements of the left hand was excised.

Ernst von Bergmann published in 1889 *Die chirurgische Behandlung von Hirnkrankheiten*, in which cases of operation for brain abscess, for brain tumour, for traumatic epilepsy, and for other cerebral conditions are described. In 1899 a much enlarged edition of this work was published.

In 1893 Macewen published his pioneer volume on *Pyogenic Infective Diseases of the Brain and Spinal Cord*, and Mott,² in 1904, contributed a valuable paper on "The Nature of the Cerebro-spinal Fluid."

Time will not allow me to give even the scantiest reference to the great volume of research

¹ *American Journal of the Medical Sciences*, 1888.

² *Brit. Med. Jour.*, 1904, ii. p. 1554.

work on the brain which, since the International Congress of 1881, has continued in an ever-widening and fruitful stream. Ferrier, in the Marshall Hall Oration (1883), said

that up to that time cerebral localisation had been absorbed like latent heat by medical science itself as distinct from medical and surgical practice, but that the unfailing safety of experiments upon animals made it clear that similar results would soon be achieved on man himself.¹

The forecast of Ferrier soon became true. Godlee² removed in London under modern conditions a brain tumour on November 25, 1884, but by the end of 1886 Horsley had done 10 operations on the brain at Queen Square. In 1879 Macewen removed a tumour of the meninges which pressed on the frontal lobe, and in 1883 he operated on a syphilitic granuloma of the paracentral lobe ; but there was no general belief in the value of brain surgery, and no general knowledge of the great new field of cerebral surgery till Horsley's experimental and operative work became known. Horsley was particularly qualified for surgical work on the brain of man by his long and intimate acquaintance with operations on the brain of the monkey. Any success which I myself have attained in the same

¹ *R. Med. Chir. Soc. Trans.*, 1884.

² *Ibid.*, 1885.

field I attribute to having, with my friend the late Dr. W. B. Hadden, performed a number of

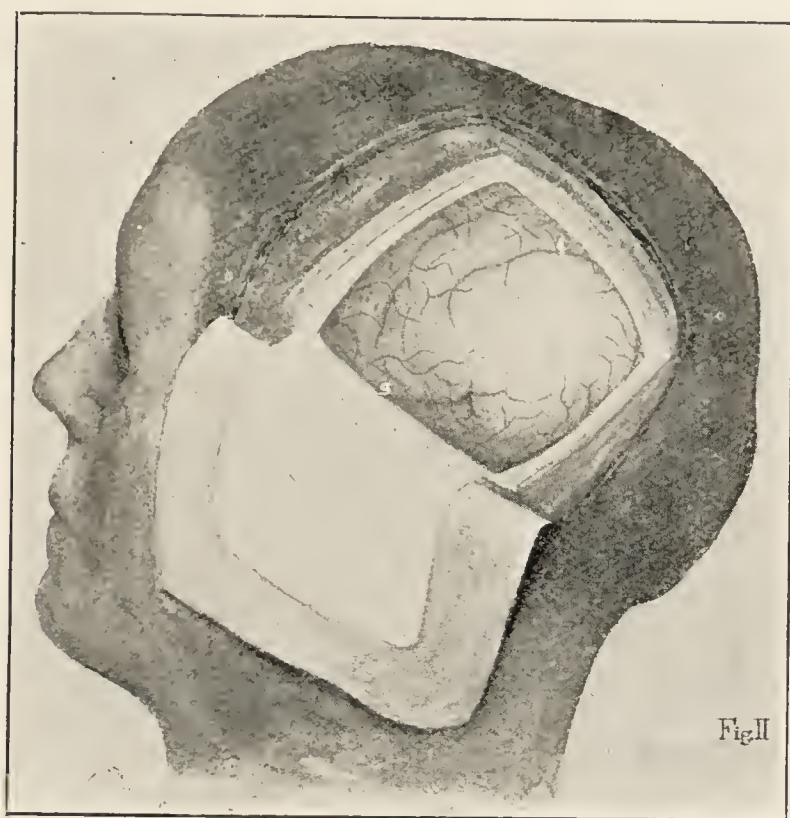


FIG. 28.—Drawing of a modern brain operation as a contrast to FIG. 16, showing operations on the head in the fifteenth century.

The scalp and dural flap has been thrown down. So great was the intracranial pressure that the meningeal arteries were empty. I marks the intraparietal sulcus and *s* the Sylvian fissure.

The cortex of the inferior parietal lobule was bulging, thinned, almost translucent towards the centre, and formed the external boundary of a gliomatous cyst.

Clinical Record.—Lady æt. 31. Ten months before being seen had a fit, other symptoms were severe headache, occasional vomiting, optic neuritis, sensory aphasia, alexia, and agraphia, slight right hemiplegia and right hemianæsthesia. There was a remarkable recovery from all the symptoms as the result of drainage of the “cyst,” but 2 months after the operation patient died of pneumonia. There was difficulty in continuous drainage of the “cyst,” as the plasma filling the cavity in a malignant tumour coagulates on cooling.

P.M.—The cavity in the tumour extended to the posterior end of the internal capsule.

stimulation and ablation experiments on the brain of the monkey. These clearly brought home to me that cerebral surgery, as at that time practised,

was not founded on knowledge, and that the brain should be treated by the surgeon like any other living tissue.

J. W. Hulke, a learned surgeon, wrote in 1882, and his views are typical of current surgical opinion at that time, for cerebral localisation was still in many minds only a *theory* !

Of late the subject of trephining for epilepsy following injuries of the head has attracted considerable attention. A fresh stimulus to it has been given by the *theory* of cerebral localisation to which in this country Professor Ferrier has so much contributed. Cases have been published illustrating the benefit of the practice. In most of these, however, local marks of injury indicated where the trephine should be applied.¹

During every decade of the last forty years the surgery of the brain has shared fully in the immense progress which has been made in all departments of surgical practice. Operations on the brain, which were few and far between at first, became of common and weekly occurrence. I remember the time well that “when the brains were out the man would die, and there an end” ;² and though this dire calamity still dogs the surgeon’s footsteps, the times have changed, for in a steadily increasing number of instances it

¹ Holmes, *System of Surgery*, ed. iii. vol. i. p. 628.

² *Macbeth*, Act III. Scene iv.

may be said of the memory of Victor Horsley, who gave his life for Britain in the Great War :

. . . Strangely-visited people,
All swoln and ulcerous, pitiful [in the brains],
The mere despair of surgery, he cures.¹

THE STEADY PROGRESS OF SURGERY AND NEUROLOGY.

The late Sir Theodore Martin, writing some time before the War, and expressing his views on the signs of the times, asked : Where are the giants ? Where are the Palmerstons, the Disraelis, the Gladstones in politics ? Where are the giants in literature ? Where in any walk of life are Alpine altitudes to be found ? It is quite easy to answer this question as far as surgery and neurology are concerned. The pageant of neurology and surgery through which I have lived has been the most glorious of all time. I have heard Virchow and Helmholtz lecture, I have seen Pasteur and Lister at work, and I possessed the inestimable privilege of the friendship of Sir James Paget. And where is it possible to discover in all the world or in all time another group of names of Alpine altitude in neurology such as our country can produce in Jackson, Schafer, Ferrier, Gowers, Sherrington, and

¹ *Macbeth*, Act IV. Scene iii.

Horsley? Schafer, Ferrier, and Sherrington are still with us. Sherrington, James Mackenzie, and Head in this country, Charles K. Mills and Harvey Cushing in America, and a splendid band of other workers continue the life of the body corporate of neurology. The body corporate has a continuous life, but a life of ever-changing form, for the individual members pass away. From year to year this organic body grows in strength and knowledge. There is no halt in the beneficent endeavour to relieve suffering and cure disease. The knowledge gained by the toil of one generation soon becomes the commonplace of the next.

The increase in knowledge of the physiology, pathology, and surgery of the brain made it possible to diagnose and operate successfully, not only on cases of brain tumour, but on many other intracranial affections. It is interesting to note how long an interval elapsed between the pathological description and illustration of disease and the adoption of systematic operative measures for its cure. Hooper¹ published beautiful illustrations of encysted abscess of, and of spreading suppuration in, the brain in 1826. Cruveilhier² published an

¹ *The Morbid Anatomy of the Human Brain*, 1826.

² *Anatomie pathologique du corps humain*, 1835.

illustration of temporo-sphenoidal abscess in 1835. Richard Bright¹ published an illustration of temporo-sphenoidal abscess in 1831 and of the temporal bone disease from which it arose. Auvert² in 1851 published a picture of cerebellar abscess, the first illustration of this disease in literature. The first full and critical account of brain abscess is that published by Lebert³ in 1856. It is based on the records of 80 cases. Lebert published in his atlas of pathology the first illustration of a cerebello-pontine tumour. *Lateral sinus pyæmia* was described by Abercrombie,⁴ Arnott,⁵ Richard Bright,⁶ and Sédillot⁷; it was described and figured by Hooper⁸ and Lebert.⁹

In 1881 Macewen¹⁰ operated on a case of temporo-sphenoidal abscess, and in 1887 Schwartz¹¹ successfully operated on a cerebellar abscess. We must not, however, forget that Morand¹² operated in 1752 with success on a monk aged fifty-one years for temporo-sphenoidal

¹ *Reports of Medical Cases*, vol. ii.

² *Selecta Praxis Medico-Chirurgica*, 1851.

³ Virchow's *Archiv*, vol. x.

⁴ *Pathological and Practical Observations on Diseases of the Brain*, 1828.

⁵ *Med. Chir. Trans.* vol. xv., 1828.

⁶ *Ibid.*, 1829.

⁷ *De l'infection purulente*, 1849.

⁸ *Ibid.*, 1826.

⁹ *Traité d'anatomie pathologique*, 1859.

¹⁰ *Pyogenic Infective Diseases of the Brain*, 1893, Case 30, p. 177.

¹¹ *Archiv für Ohrenheilkunde*, vol. xxix. p. 163, 1890.

¹² *Opuscles de chirurgie*, Paris, 1768, p. 161. See for this case and others, *Essays on the Surgery of the Temporal Bone*, 1919, vol. ii. p. 341.

abscess. Of those who have contributed to the slow but certain progress of surgery some are known but many are unknown to fame ; we ought never to forget what is due to those who have gone before. But it may well be that in the history of surgery

the most important part is lost without recovery, and, as thanksgivings were once wont to be offered for unrecognised mercies, look with reverence into the dark untenanted places of the past, where in formless oblivion many of our chief benefactors, with all their strenuous endeavours, lie entombed.¹

This is no new opinion, for Celsus said :

Though we should not refuse to give modern authors due credit for their discoveries or happy imitations, it is none the less just to restore to the ancients what properly belongs to them.²

The formation of abscess of the brain under compound fracture of the vault of the skull was known and treated long before the treatment of brain abscess became a common surgical procedure. Such an abscess may occur long after the original injury ; I have known one case which was fatal twenty years after the original injury to the cranium. Dupuytren,³ in one of his lectures, says :

¹ Carlyle on History.

² Celsus, *Liber Medicinæ Secundus*, cap. xiv.

³ *Leçons orales*, second edition, vol. vi., 1839.

In certain cases of deeply seated fluid collections we must incise the dura mater, the arachnoid and the brain itself, and by this bold proceeding patients have been saved.

And further he continues :

Relying also on the success of J. L. Petit, Boyer



FIG. 29.—Guillaume Dupuytren (1777–1835).

Chirurgien en chef de l'Hôtel-Dieu. Professeur de clinique chirurgicale de la Faculté de Médecine de Paris. Premier chirurgien du Roi. Le plus grand chirurgien du dix-neuvième siècle, qui fut baron de royaume. Membre de l'Institut et de l'Académie de Médecine.

concurs in the advice of Quesnay, and does not fear to plunge the bistoury quite deeply into the very substance of the brain in order to evacuate traumatic effusions, and it has fallen to my lot to do so several times with success.

Dupuytren, in his account of such a case, says simply :

I incised the dura mater, nothing came out ; I thrust a bistoury cautiously (? so as to avoid the vessels of the cortex) into the brain and there welled up immediately a flood of pus. That very night all the symptoms disappeared and the patient recovered.

In 1884 Zaufal¹ recommended that the internal jugular vein should be tied in cases of lateral sinus pyæmia.² Arbuthnot Lane first performed the operation in 1888. In 1903 a large hæmatocele was removed successfully from the subdural space of a man.³ In the same year Harvey Cushing operated for the removal of an apoplectic clot from the brain,⁴ and in 1905 he published cases of successful operation on the intracranial hæmorrhages of the new-born.⁵ The publication of Quincke's⁶ papers on lumbar puncture in 1891 and on meningitis serosa in 1893 is a landmark in the history of the diagnosis and treatment of the various forms of meningitis, and in recent years operations on cases of meningitis have led to the saving of many lives.⁷

¹ *Prag. med. Woch.*, 1884.

² *Clin. Soc. Trans.*, 1889, p. 260.

³ Ballance, *Some Points in the Surgery of the Brain*, 2nd ed. p. 22.

⁴ *American Journal of the Med. Sciences*, 1903, pp. 1032-1036.

⁵ *Ibid.*, October 1905.

⁶ *Verhandl. des Congres für innere Medizin*, 1901, p. 322, and Volkmann's *Klinische Vorträge*, New Folge, No. 67.

⁷ See Irvine Haynes's *Transactions of American Laryng., Rhinolog., and Otolog. Soc.*, 1912. Also Kopetzky's paper in the same volume on the "Pathology of Meningitis." Also Ewing Day's paper in the same *Transactions* for 1913. See also papers by Dr. Reynolds on "Meningitic Epilepsy," *Californian State Journal of Medicine*, August 1921. "The Radical Cure of Hydrocephalus," *International Clinics*, vol. iii. Series 31 ;

These few examples must suffice. During every decade since 1881 new surgical problems have been successfully solved, and the surgeon's art in cases of intracranial disease continues to triumph along many lines of advance. I sometimes think, however, that with all the scientific knowledge we now possess as an aid to diagnosis, we lack, perhaps, in some degree the diagnostic insight or instinct—the supreme gift—possessed by some of the great surgeons of the past.

CONCLUSION.

What is the lesson to be garnered from the story of the surgery of the brain? In the gradual evolution of truth it would seem that at the end of each stage of the world's history a great man appears, who focusses in his speech and writing the best thoughts of the preceding centuries, or who is a messenger of a new knowledge: the herald of the dawn of a wider insight into light and truth. Carlyle, in his lecture on the hero, as poet, takes as examples Dante and Shakespeare. He says:

And so in this Dante ten silent centuries in a very strange way found a voice. . . . Dante has given the

and "Infective External Hydrocephalus," *Brit. Med. Jour.*, July 1921; and "Diagnosis and Treatment of Meningitis," by C. A. Ballance, *Bri. Med. Jour.*, Sept. 10, 1921.

Faith or Soul ; Shakespeare in a not less noble way, has given us the Practice or body. This latter also we were to have ; a man was sent for it, the man Shakespeare. Just when that chivalry way of life had *reached its last finish* and was on the point of breaking down into slow or swift dissolution, as we now see it everywhere, this other Sovereign Poet, with his seeing eye, and his perennial singing voice, was sent to take note of it, to give long enduring record of it. Two fit men—Dante, deep, fierce, as the central fire of the world ; Shakespeare, wide, placid, far-seeing, as the Sun, *the upper light of the world*.

So it has been in the story of the history of surgery. Some names, like those of Hippocrates, John Hunter, Joseph Lister, mark epochs in the advancement of knowledge. Hippocrates represents the highest development of clinical research. Morgagni, anatomist and pathologist, bridges the gap between the famous anatomists of the Middle Ages and the great pathologists of the first half of the nineteenth century. Auvert, Cruveilhier, Lebert, Bright, Hooper, and Carswell came just when the knowledge of morbid anatomy seemed to have *reached its last finish*.

John Hunter awoke in the minds of his pupils and later followers a desire to explore the old ground by the new experimental method, and to unearth truths long concealed. “ There was a spirit of adventure, like that which animated the Elizabethan explorers, the ambition of the

healthy human intellect to extend its range of vision and of knowledge. To Hunter belongs the credit of rediscovery of this new world. He it was who lighted the torch. His pupils, like Astley Cooper, were those who first carried it forward in the race, kept it alight, and then passed it on, not only undiminished, but burning with a brighter flame.”¹

Galen and Harvey were Hunter's great fore-runners in the use of the experimental method ; but, unlike Hunter, neither left behind when they passed into the silent world, as far as we know, a great band of pupils and followers to keep alight the fire of experimental research. The names of Larrey (1766-1842), Guthrie (1785-1856), Cheselden (1688-1752), Dupuytren (1778-1835), Syme (1799-1870), and Fergusson (1807-1877) are fit examples of the time when the art of surgery was based on anatomy and pathological anatomy alone, and when many thought that art must needs have reached its final limits. But there is *no last finish* in the path of surgical progress. In the fulness of time Lister, *the upper light of surgery*, appears. He was the herald of the dawn of scientific surgery, the harbinger of a wider insight into surgical thought and practice, and his life and

¹ Sir Charters Symonds, Hunterian Oration, 1921.

work gave promise of a wider hope and of more and more splendid triumphs of our Art.

I have tried to trace the history of the surgery of the brain from the Neolithic age, and to develop the theme that modern neurological surgery rests on the sure foundation of experimental physiology. A real knowledge of anatomy and



FIG. 30.—Joseph Lister.

“The upper light of Surgery.”

pathology, the recognition of the microbic origin of disease, the rise of the experimental method of research, and the discovery of anæsthesia by Morton and Simpson, were essential preliminaries to further progress. The immortal labours of Pasteur and of Lister which have given imperishable renown to these greatest benefactors of the human race, made straight the

way for us their humble surgical followers. In the fulness of time, Victor Horsley, a man specially trained and of great industry and ability, created the new department of neurological surgery. He made what was before his time a hazardous, dubious, and hardly recognised operation, one which rests on the surest scientific foundations, and is practised at the present time in every surgical clinic.

But I must now finish.

None of us have seen Hippocrates in the flesh, but his spirit rules our lives, energises our teaching, and stimulates our clinical investigations. "The wonderful figure, character, and spirit of Hippocrates," writes Dr. Singer, "are more real and living to-day than they have been since the collapse of the Greek scientific intellect in the third and fourth centuries of the Christian era."¹

None of us have seen John Hunter in the flesh. His life was occupied in testing, by means of experiment, every problem that presented itself. Hunter's influence upon the surgical profession was universal and immense. We feel his spirit is still present in our life and work as we wander through the rooms of the Hunterian Museum. From the time of Hunter to that of Lister many surgeons of this College were endeavouring to

¹ Dr. Charles Singer, *ibid.*

discover the secrets of surgery and surgical pathology by way of experiment. Sir Thomas Browne¹ says in a beautiful passage :

The wisdom of God receives small honour from those vulgar heads that rudely stare about, and with a gross rusticity admire His works. Those highly magnify Him, whose judicious enquiry into His acts, and deliberate research into His creatures return the duty of a devout and learned admiration.

I have an uneasy feeling, shared by some of my friends, that during the last two or three decades *the cult of operating* among some of the younger Fellows of this College has displaced in part the sacred duty, laid upon each one of us, of adding one more stone to the building of surgical knowledge. Every man is a debtor to his profession. We are pilgrims of surgery who have reached only to the threshold of Truth. A vast field of our art and science still remains unmapped and unexplored. I trust that succeeding generations of surgeons, who look upon this College as their alma mater, will devote time to research work. Research adds zest and satisfaction to life, and gives the promise of that thrill of delight which accompanies the first perception, the slow unfolding of some new truth or principle. Thus may we surgeons

¹ *Religio Medici*, section 13.

rightly forge new weapons against disease and death. Wisdom and yet more wisdom is our goal as we grope our onward way “upon this bank and shoal of time,”¹ for is it not written, “She is more beautiful than the sun, and above all the order of the stars ; and being compared to the light she is found before it. She is the brightness of the everlasting light, the unspotted mirror of the power of God, and the image of His goodness.”²

The following notes have been kindly sent to me by my friend Dr. George Jones from his reading in the British Museum :

Note to page 37.

ALBUCASIS = KALAF IBN ABBAS. *La Chirurgie d'Albucasis*.
Dr. Leclerc. 8vo. Paris. 1861.

This is a translation in French based partly on Arabic MSS. and partly upon the standard text of Channing.

Page vi.—“Albucasis is the first writer who has given us descriptions of surgical instruments with figures. If his is not the sole example of an illustrated book it is the only one which has come down to us from antiquity.”

Page xii.—“Channing reproduced the figures as he found them in the text,” but Dr. Leclerc goes on to say that “these figures are rude, unintelligible, and at variance with the descriptions set out in the Arabic text.” He has accordingly adopted *conjectural emendations* of the drawings to make them agree with the text!

¹ *Macbeth*, Act I. Scene vii.

² Wisdom of Solomon vii. 26 and 29.

At the end of the book are two large plates, chiefly of various cauteries but no trephines. Indeed, trephining does not seem to be mentioned. There are two MSS. of Albucasis at Oxford and one or more in Paris. The British Museum has a copy of the *editio princeps*, 1471, and several later, including Channing.

Note to page 75.

C. SOLINGEN, M.D., M.Ch. *Manuale Operationen der Chirurgie.*
4to. Amsterdam. 1684. (In Dutch.)

Chap. vii. p. 29, top of page.—" . . . of which we have an example in the case of Philip of Nassau, Lord of Grimhuyse, then living at Wichen, a village in the district (*Rijck*) of Nymegen in the state of Grave in Gelderland, who while riding on horseback was thrown and broke his skull. He was the son of Justin of Nassau, son of Prince William I. of Orange. This Justin was Governor of Breda. Philip was trepanned (*getrepaneert*) seven-and-twenty times by Mr. Henry Chadborn, Surgeon in Nymegen, who had a certificate (*attestatie*) in the patient's own hand of the operation performed (undertaken) at Wichen on the 30th August 1664, drawn up by the schoolmaster, Amos Chadborn, a brother of the Surgeon. Afterwards Philip and his friends drank so hard that three persons died in consequence."

Further on are a number of line engravings of various surgical instruments, amongst others a "trepan."

THE END

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